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THE
NEW ELEMENTARY
ARITHMETIC
THE NORMAL COURSE IN NUMBER

· INDIANA · EDITION ·

COOK AND   CROPSEY

SILVER, BURDETT AND COMPANY
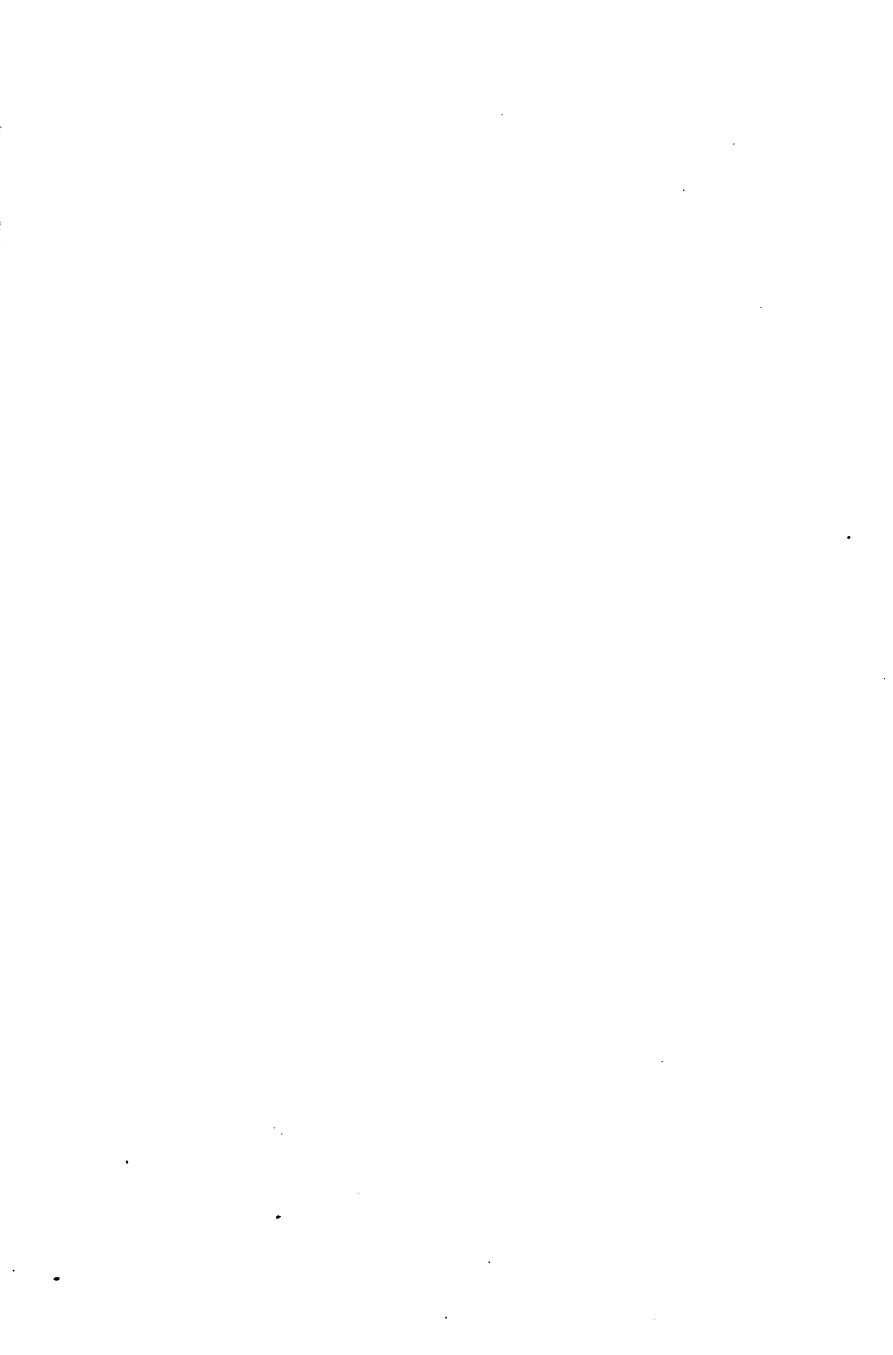
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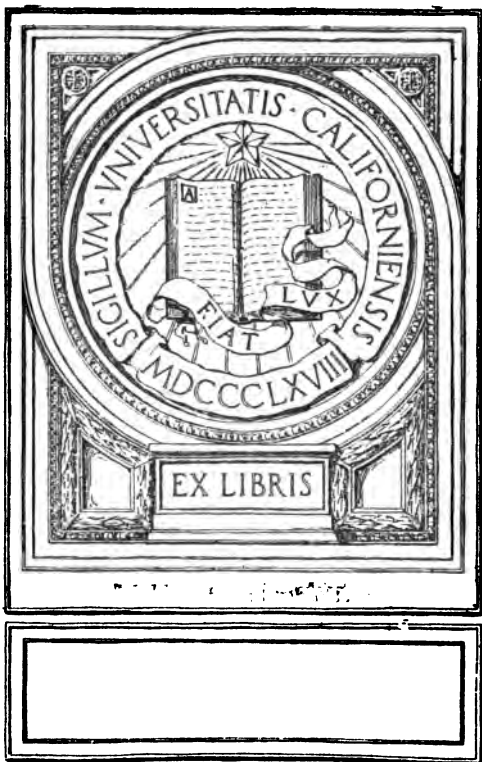
The Normal Course in Number

THE NEW

ELEMENTARY ARITHMETIC

BY

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SILVER, BURDETT AND COMPANY

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PREFACE TO THE REVISED EDITION

THE present edition of "The New Elementary Arith-
metic" will be found to differ from the earlier edition
principally in an increase in the amount of drill work
given upon the fundamental operations. This change, it
is believed, recognizes a tendency of present-day arith-
metic work which has the approval of the best authorities.

In a few other respects also the book has been changed,
notably in the direction of simplification and the bringing
of the book into harmony with the advance which has
been made in the teaching of arithmetic since the first
edition appeared.

In making these changes, the arrangement of the mat-
ter has been altered, a large number of new exercises have
been added, and the problems in many cases have been
rewritten or replaced.

It is hoped that the present book will be found thor-
oughly abreast of the best practice in the teaching of
arithmetic, and that in its new form the work will con-
tinue to enjoy the confidence and appreciation which have
been so kindly extended to it up to the present time.

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PREFACE TO THE FIRST EDITION.

IT has seemed to the authors of the NORMAL COURSE IN NUMBER that there is room for another series of Arithmetics, notwithstanding the fact that there are many admirable books on the subject already in the field.

The ELEMENTARY ARITHMETIC is the result of the experience of a supervisor of primary schools in a leading American city. Finding it quite impossible to secure satisfactory results by the use of such elementary arithmetics as were available, she began the experiment of supplying supplementary material. An effort was made to prepare problems that should be in the highest degree practical, that should develop the subject systematically, and that should appeal constantly to the child's ability to think. The accumulations of several years have been carefully re-examined, re-arranged, and supplemented, and are now presented to the public for its candid consideration.

Not the least valuable feature of this book is the careful gradation of the examples, securing thereby a natural and logical development of number work. No space is occupied with the presentation of theory, — that side of the subject being left to the succeeding book. The first thoughts are *what* and *how*, — these so presented that the processes shall be easily comprehended and mastered. Subsequently, the *why* may be intelligently considered and readily understood.

INTRODUCTION.

It has been said that the " new education " proceeds to give the child an experience, instead of presupposing one for him. Pupils become practical, not by learning forms of reasoning, but by exercising the reason upon their own plane of comprehension. In such a spirit this ELEMENTARY ARITHMETIC has been prepared. It presents three-years' work, based upon carefully graded exercises which may be used as a means of training pupils to think, and of teaching at the same time the practical application of numbers to ordinary business transactions.

It is very important that children should master the fundamental processes so thoroughly that they come to serve thought without loss of time or energy. The patient following of these graded exercises and drills should secure this result. In general, division and multiplication, as converse processes, are followed by addition and subtraction on the same general plan. As the work becomes more complex, it is difficult to make this alternation with perfect regularity without detriment to the efficiency of the work. Stress must be laid upon such a complex subject as long division, a very difficult subject for children, which requires an amount of practice that, at first view, might seem out of proportion to the practice given in other subjects.

The primary facts of addition and subtraction are presented in the first twenty pages. Neither accuracy nor rapidity in calculation can be secured until these combina-

tions can be given with readiness. These facts are used again in the tables of " endings," for application to numbers above *twenty.* These tables have a practical value and should be as thoroughly applied as the multiplication and division tables. These tables in subtraction give an opportunity for reviewing the primary facts, and for using this knowledge with numbers above *twenty,* but they have no such direct application as the tables in addition. Any reasonable system of teaching addition can be used with the graded examples of the ELEMENTARY ARITHMETIC.

The first and hardest step in solving an arithmetical question is to determine the processes required; the second, to state the different steps of the solution in proper arithmetical form. Children can give results long before they are conscious of the process by which the results are obtained. The statement of the process by means of arithmetical signs and figures is a new language to the pupil; it is not surprising that the mastery of this language takes time and skillful teaching. The statement of the result, in a concrete problem, is probably all that should be required in the second school year. It may be desirable to introduce a simple statement of the process early in the third year. Such a statement can be added to the sentence giving the result, as on page 16, example 1 : 4 cents × 3 = 12 cents. No formula should be taught with the thought that it will do the thinking for the pupil. Let the problem be pictured, and this picturing followed by the expression in figures, before any formal expression in words is attempted. The object of picturing problems is not to teach children to make pictures (though all this work should be done with reasonable care), but to give a method of representation by which they can make their thoughts clear to themselves. It is
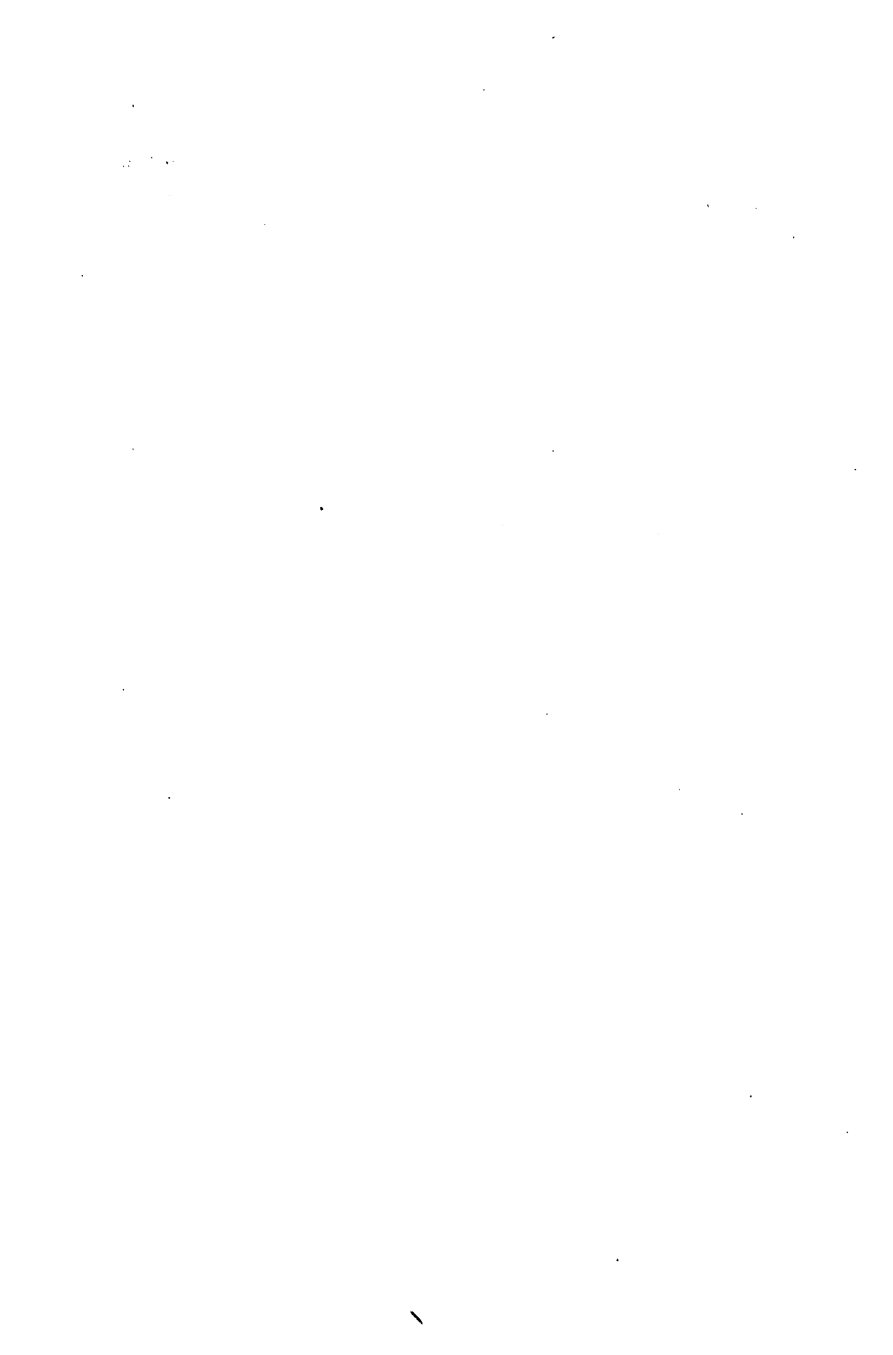
a means, not an end, and should be so regarded. When problems can be stated clearly and solved correctly there is no further necessity for picture representation, except as a means of testing the pupil's comprehension of spoken or written forms. Let not objective work be undervalued, however. It is a very necessary means, which, rightly used, will secure accurate knowledge and a correct use of terms, thus saving much time and confusion later on. Pupils should learn early to show objectively the difference between *six* and *one-sixth of six*, between one-sixth of *six* and one-sixth of *one*, etc.

Problems which may be worked out orally in the recitation will often be found too difficult for a written test. "Miscellaneous problems" should be used with discrimination, the teacher selecting such as seem suited to the capacity of the class.

All measures introduced should be learned by actual use. The standards in common use, such as the *yard, foot, ounce, pound, quart,* etc., can be obtained easily, and should form a part of the regular school supplies. Exercises in estimating volume and extension train the judgment while giving practical results in knowledge, and there is no time in the course when pupils can better afford to do this work than during the first years of the elementary school course.

Rules may be made by the pupils after the process is learned from which the rule is derived.

This book has grown from *experience*, and is offered to fellow-teachers as a systematic work-book.

CONTENTS.

THE NEW
ELEMENTARY ARITHMETIC.

CHAPTER I.

1 2 3 4 5 6 7 8 9

1. Write the names of the numbers from one to ten.
Write the figures which stand for these numbers.
Count one hundred by ones; by tens.
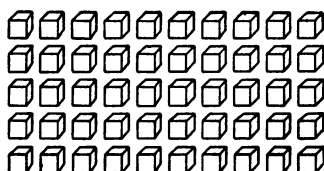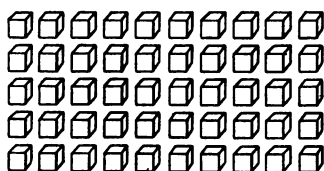
NUMBERS THROUGH TWELVE.

[*A review of work learned in the second school year.*]

2. Count by ones through twelve; count by twos; by
threes; by fours.

Begin with *twelve* and name the numbers in their order
to *one*.

Name two numbers which together make four; two
numbers which make six.

Addition and Subtraction,

3. *Sums of any two numbers through eight.*

1	1	2	1	2	1	2	3	1	2	3	1	2	3	4
2	3	2	4	3	5	4	3	6	5	4	7	6	5	4
3	4	4	5	5	6	6	6	7	7	7	8	8	8	8

1 and 2 are —	5 less 3 is —	7 less 5 is —
3 less 2 is —	1 and 5 are —	4 and 3 are —
1 and 3 are —	6 less 5 is —	7 less 3 is —
4 less 3 is —	4 and 2 are —	7 less 4 is —
2 and 2 are —	6 less 2 is —	6 and 2 are —
4 less 2 is —	3 and 3 are —	8 less 2 is —
1 and 4 are —	6 less 3 is —	8 less 6 is —
5 less 4 is —	5 and 2 are —	5 and 3 are —
2 and 3 are —	7 less 2 is —	8 less 3 is —

4. What two equal numbers make four?

Separate *four* into two equal parts. Take away one of
of the parts; what is left?

Separate *eight* into two equal parts. Take away one of
the parts; what is left?

Separate *eight* into two *unequal* parts. Take away one
of the parts; what number is left?

5. *Sums of any two numbers through twelve.*

1	2	3	4		1	2	3	4	5		1	2	3	4	5
8	7	6	5		9	8	7	6	5		10	9	8	7	6
9	9	9	9		10	10	10	10	10		11	11	11	11	11

	1	2	3	4	5	6
	11	10	9	8	7	6
	12	12	12	12	12	12

7 and 2 are —   7 and 3 are —
9 less 7 is —   10 less 3 is —
6 and 3 are —   10 less 7 is —
9 less 3 is —   6 and 4 are —
5 and 4 are —   10 less 4 is —
9 less 4 is —   10 less 6 is —
9 less 5 is —   9 and 2 are —
8 and 2 are —   11 less 2 is —
10 less 2 is —   11 less 9 is —

8 and 3 are —   9 and 3 are —
11 less 3 is —   12 less 3 is —
11 less 8 is —   8 and 4 are —
6 and 5 are —   12 less 4 is —
11 less 5 is —   12 less 8 is —
11 less 6 is —   7 and 5 are —
7 and 4 are —   12 less 5 is —
11 less 4 is —   12 less 7 is —
11 less 7 is —   12 less 6 is —

6. Find the sums, giving results only:

2	4	2	1	2	3	2	4	1	2	4	3	7	5	5	1	3
4	3	5	6	3	5	7	4	8	6	5	4	2	3	4	9	6

NOTE TO TEACHERS.—If the children are not very familiar with these fundamental facts, sufficient time must be given to secure a thorough mastery of them. If necessary, the work must be given with the objects. As soon as possible, however, children should become independent of the use of objects.

2	5	3	8	4	6	7	9	6	2	5	3	5	3	3	4	9
8	2	7	2	6	3	3	1	4	9	6	7	4	5	8	7	2

	8	6	3	4	3	4	7	5	10	6	8	9	6	5	7
	3	3	9	8	4	5	3	7	2	6	2	3	5	7	4

Supply the numbers omitted:

6	6	2	3	4	6	2	5	1	7	3	3	6	5	4
10	11	8	9	7	12	9	11	6	12	11	10	9	8	9

4	4	7	5	9	8	7	8	9	3
12	11	10	12	11	12	11	10	11	12

Subtract at sight, giving results only:

8	6	7	5	6	8	9	10	8	7	11	12	10	8	7	6
5	4	3	2	4	6	5	6	7	2	6	7	8	5	2	2

11	9	10	11	12	9	10	7	10	12
5	3	7	6	5	2	3	1	8	4

11	9	8	12	12	11	12	12
4	8	4	7	8	8	9	7

7. 1. Henry bought a book for 8 cents and a pencil for 4 cents; he paid — cents for both.

2. There were 4 boys and 6 girls in a class; together there were — children.

3. Helen had 11 roses and gave 4 of them to May; Helen then had — roses.

4. James earned 7 cents and George earned 5 cents; together they earned — cents.

5. Make problems for:

6 and 3 are 9.	9 and 3 are 12.
10 less 6 is 4.	11 less 5 is 6.

NOTE.—The children should group objects and make the problems with the objects before them. This work is for the recitation, not the study period.

Multiplication and Division.

8.

(1)	(2)	(3)
2 twos are —	6 twos are —	2 fours are —
3 twos are —	2 threes are —	3 fours are —
4 twos are —	3 threes are —	2 fives are —
5 twos are —	4 threes are —	2 sixes are —

(4)	(5)	(6)
6 is — twos.	12 is — threes.	8 is — fours.
8 is — twos.	12 is — fours.	6 is — threes.
9 is — threes.	12 is — sixes.	10 is — fives.

(7)	(8)
One-half of 4 is —	One-half of 10 is —
One-half of 6 is —	One-half of 12 is —
One-half of 8 is —	One-third of 6 is —

(9)	(10)
One-third of 9 is —	$\frac{1}{3}$ of 9 is —
One-third of 12 is —	$\frac{1}{3}$ of 12 is —
One-fourth of 8 is —	$\frac{1}{4}$ of 8 is —
One-fourth of 12 is —	$\frac{1}{4}$ of 12 is —

9. 1. Frank bought 4 pencils at 3 cents each; for all he paid — cents.

2. Mary has 10 cents; oranges cost 5 cents each; she can buy — oranges.

3. William has 8 apples; he divides them equally between his two brothers; each receives — apples.

4. Anna has 9 nuts; she divides them equally among three children; each child receives — nuts.

5. Anna has 12 roses, and gives 4 roses to each of her sisters; she has — sisters.

6. Make similar problems, using the following forms:

2 threes are 6.	9 is 3 threes.	One-half of 12 is 6.
3 fours are 12.	10 is 5 twos.	One-third of 9 is 3.
8 is 4 twos.	8 is 2 fours.	One-fourth of 12 is 3.

NOTE.—This work is to be given in the recitation and under the direction of the teacher. No attempt should be made to state the process either in words or figures. It is well to have children lay out the objects on the desk and make their statements with the objects before them. Buttons or small pasteboard tablets make convenient counters. In a problem like Number 5 above, let the children lay out buttons or grains of corn for the roses, and see that 3 fours can be taken out of 12. A stick or tooth-pick might be placed under each of the fours. These sticks represent the real answer to the problem, the number of sisters.

THE ONE-INCH SQUARE AND THE INCH.
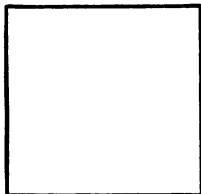
ONE INCH SQUARE.

ONE INCH.

THREE INCHES.

10. 1. Cut from paper a square which is one inch on each side.

2. Draw a line one inch long.   Draw upon the board a line twelve inches long.

Twelve inches are equal to one foot.

3. Cut from paper a measure one foot in length.   Find one-half of a foot   One-third of a foot.

4. Draw a square which is two inches on each side.   How many inches is it around the square?

5. Cut this square from paper; fold it so as to show four small one-inch squares.

6. Place two one-inch squares side by side.   Make a drawing which is two inches long, and one inch wide.

7. 6 inches are — — of a foot.

8. 3 inches are — — of a foot.

9. 4 times 3 inches are — inches.

10. 3 times 3 inches are — inches.

11. $\frac{1}{6}$ of 12 inches is — inches.

12. How much longer is a twelve-inch line than a six-inch line?

13. How much longer is a twelve-inch line than a nine-inch line?

14. How many are 3 times 3 square inches?

15. How many inches is it around a square which measures two inches on each side?

16. Julia has a piece of ribbon 12 inches long, which she divides into 4-inch pieces; how many pieces are there?

17. Ella has a pencil eight inches long. When she has used 3 inches, how many inches will be left?

NOTE.—In this review of the work of the Second Grade, all exercises must necessarily be much condensed. Children should be familiar with the *one-inch square*, the *inch* and the *foot*. Begin with the cube and derive from it the one-inch square. Children should use these measures in their daily work, whenever opportunity offers.

PINTS AND QUARTS.

PINT.   QUART.

11. 1. A quart of milk is how many pints?

2. A pint is what part of a quart?

3. How many quart measures can I fill with four pints of milk?

4. 6 pints equal — quarts.   6 quarts equal — pints.

5. 3 quarts equal — pints.   5 quarts equal — pints.

6. 10 pints equal — quarts.   8 pints equal — quarts.

7. 3 pints are how much more than a quart?

8. 5 pints are how much more than two quarts?

NUMBERS THROUGH SEVENTEEN.

12. Count seventeen by ones.

Write the names of the numbers through seventeen.

Begin with *seventeen* and name the numbers in their order to *one*.

Addition and Subtraction.

13. *Sums of any two numbers through seventeen.*

1	2	3	4	5	6	
12	11	10	9	8	7	
13	13	13	13	13	13	

1	2	3	4	5	6	7
13	12	11	10	9	8	7
14	14	14	14	14	14	14

1	2	3	4	5	6	7
14	13	12	11	10	9	8
15	15	15	15	15	15	15

1	2	3	4	5	6	7	8
15	14	13	12	11	10	9	8
16	16	16	16	16	16	16	16

1	2	3	4	5	6	7	8
16	15	14	13	12	11	10	9
17	17	17	17	17	17	17	17

Separate fourteen into two equal parts.   Take away one of the parts   what is left?

Separate fourteen into two unequal parts.   Take away one of the parts; what is left?

What number must you add to 9 to make 14?

What number must you add to 8 to make 13?

14.   1. 10 plus 3 equals 13.   2. 13 less 3 equals 10.

$$10+3=13.$$ $$13-3=10.$$
$$7+6=?$$ $$13-6=?$$
$$6+8=?$$ $$14-8=?$$
$$9+5=?$$ $$14-5=?$$
$$5+8=?$$ $$13-8=?$$
$$4+9=?$$ $$13-9=?$$

3. $$8+3=11.$$ 4. $$12-9=3.$$
$$9+5=14.$$ $$13-2=11.$$
$$7+7=?$$ $$13-3=?$$
$$5+9=?$$ $$13-4=?$$
$$9+4=?$$ $$14-9=?$$
$$8+5=?$$ $$14-6=?$$
$$6+7=?$$ $$13-7=?$$

NOTE.—Teach the signs + (plus), − (less), and = (equals).

5. Find the sums, giving results only:

7	6	3	4	2	6	4	9	6
7	7	6	9	8	8	5	5	4

5	6	6	9	5	7	5	6	4
8	3	8	4	8	6	7	5	8

6. Supply the numbers omitted:

6	8	5	9	4	6	7	5	9	4
14	12	13	14	11	14	13	12	13	14

3	7	8	6	9	3	4	7	9	8
11	13	14	13	12	11	12	13	14	13

7. A man planted 8 apple trees and 9 pear trees; how many trees did he plant?

8. I had 14 dollars, and spent 9 dollars for a table; how many dollars had I left?

9. Ella has 6 roses and 7 violets; how many flowers has she?

10. John had 14 cents, and spent 6 cents for a top; how much money had he left?

11. Make problems for:

$8+6=14$	$13-8=5$	$14-9=5$	$6+7=13$
$9+4=13$	$14-6=8$	$12-5=7$	$12+2=14$

15. Add the horizontal lines from left to right, naming each sum:

(1)	(2)	(3)	(4)	(5)	(6)
3,2,4	1,8,4	2,3,8	1,9,4	3,3,8	1,4,9
2,6,3	2,7,3	1,7,6	2,6,5	3,4,6	3,5,5
3,5,4	1,2,9	2,6,3	3,2,8	2,5,5	3,9,2

(7)	(8)	(9)	(10)
$10+5=?$	$9+6=?$	$16-8=?$	$16-\ 9=?$
$7+8=?$	$7+9=?$	$15-7=?$	$15-\ 8=?$
$8+8=?$	$6+9=?$	$16-7=?$	$15-10=?$
$9+8=?$	$8+9=?$	$17-9=?$	$17-\ 8=?$

11. Find the sums, giving results only:

5	1	3	2	5	3	8	4	6	7	6	2	5	3	4	3	3
4	9	6	8	2	7	2	6	3	3	4	9	6	7	5	8	5

4	9	8	6	2	4	2	1	2	3	2	4	1	2	4	3	7
7	2	3	3	4	3	5	6	3	5	7	4	8	6	5	4	2

5	3	4	3	4	7	5	10	6	8	9	6	5	7	4	9	7
3	9	8	4	5	3	7	2	6	2	3	5	7	4	9	5	7

5	3	9	6	8	4	8	11	11	6	5	8	7	8	11	6
8	10	4	7	6	9	5	2	3	8	9	7	9	8	5	9

12	9	7	6	5	5	8	4	6	9	5	8	9	9	6	3	7
4	6	8	7	9	6	4	7	9	5	7	5	4	6	7	8	4

9	6	9	7	8	8	6	10	8	9
7	8	5	9	7	9	9	6	7	8

12. Supply the numbers omitted:

9	6	5	9	8	6	7	6	9	7	6	9	5
12	13	14	16	15	13	12	16	16	16	14	13	12

5	6	6	9	9	7	7	9
16	13	15	17	15	15	12	15

5	8	9	9	8	8	7	8
14	12	14	17	15	17	16	17

13. Subtract the lower number:

8	6	7	5	6	8	9	10	8	7	11	12	10	8	7	6
5	4	3	2	4	5	5	6	7	2	6	7	8	5	2	2

11	9	10	11	12	9	10	7	10	12	11	8	12	11
5	3	7	6	5	2	3	1	8	4	4	4	7	8

12	10	12	13	11	14	12	13	14	11	12	14	13
9	8	8	6	5	9	7	9	8	6	4	5	8

14	12	13	14	14	13	14	11	13	15	16	15	14
4	3	4	9	5	7	6	7	6	9	7	6	6

16	16	16	15	15	13	15	14
9	8	5	10	7	8	8	8

12	16	15	17	17	16	14	17
7	7	9	9	8	9	9	8

Multiplication and Division.

16.

$7 \times 2 = 14$	$14 \div 2 = 7$
$2 \times 7 = 14$	$14 \div 7 = 2$
$8 \times 2 = 16$	$16 \div 2 = 8$
$2 \times 8 = 16$	$16 \div 8 = 2$
$5 \times 3 = 15$	$15 \div 3 = 5$
$3 \times 5 = 15$	$15 \div 5 = 3$

$\frac{1}{2}$ of $14 = 7$ $\frac{1}{4}$ of $16 = 4$

$\frac{1}{2}$ of $16 = 8$ $\frac{1}{3}$ of $15 = 5$

NOTE.—The children should make these tables by means of objects, laying down two sevens, seven twos, etc.

The sign $\times$ is always read "multiplied by." $6 \times 2 = 12$ is read "6 multiplied by 2 equals 12." $2 \times 6 = 12$ is read "2 multiplied by 6 equals 12."

The sign $\div$ is read "divided by." $12 \div 2 = 6$ is read "12 divided by 2 equals 6." $12 \div 6 = 2$ is read "12 divided by 6 equals 2."

17. 1. Albert works in his garden 2 hours each day; how many hours does he work in 6 days?

2. If a kite costs 8 cents, how many kites can be bought for 16 cents?

3. If a boy rides 8 miles an hour on his bicycle, how many hours will it take him to ride 16 miles?

4. A lady divided 16 pencils equally among her four children; how many pencils did each receive?

Make problems orally for:

(5)	(6)	(7)
$3 \times 5 = 15$	$16 \div 8 = 2$	$\frac{1}{2}$ of $14 = 7$
$4 \times 4 = 16$	$16 \div 2 = 8$	$\frac{1}{3}$ of $15 = 5$
$2 \times 8 = 16$	$15 \div 3 = 5$	$\frac{1}{4}$ of $16 = 4$

NOTE.—Have the children make these problems in class, using objects.

18.   **REVIEW.**

NOTE.—These tables may be used for oral recitation, the pupil giving answers rapidly; or for occupation during the study period; or for oral tests, the work being dictated by the teacher.

$7 \times 2 =$	$3 \times 3 =$	$2 \times 8 =$	$2 \times 6 =$
$10 \div 2 =$	$9 \div 3 =$	$8 \div 4 =$	$10 \div 5 =$
$3 + 5 =$	$7 + 3 =$	$3 + 4 =$	$3 + 7 =$
$16 - 7 =$	$16 - 9 =$	$16 - 8 =$	$15 - 8 =$
$9 + 3 =$	$6 + 4 =$	$3 + 9 =$	$6 + 4 =$
$15 - 7 =$	$15 - 8 =$	$14 - 5 =$	$14 - 9 =$
$4 + 8 =$	$3 + 8 =$	$2 + 6 =$	$8 + 3 =$
$13 - 9 =$	$13 - 4 =$	$13 - 5 =$	$13 - 8 =$
$7 + 5 =$	$4 + 7 =$	$8 + 4 =$	$9 + 7 =$
$13 - 6 =$	$13 - 7 =$	$3 \times 2 =$	$2 \times 3 =$
$3 + 7 =$	$5 + 6 =$	$5 + 7 =$	$7 + 8 =$
$6 \times 2 =$	$2 \times 4 =$	$4 \times 4 =$	$16 \div 8 =$
$8 + 8 =$	$8 + 7 =$	$9 + 5 =$	$5 + 9 =$
$2 \times 5 =$	$3 \times 5 =$	$4 \times 4 =$	$2 \times 7 =$
$7 + 9 =$	$7 + 7 =$	$6 + 9 =$	$9 + 6 =$
$\frac{1}{2}$ of $14 =$	$\frac{1}{3}$ of $12 =$	$\frac{1}{3}$ of $15 =$	$\frac{1}{4}$ of $16 =$
$12 \div 3 =$	$14 \div 2 =$	$15 \div 5 =$	$4 \times 4 =$

19. $\frac{1}{3}$ of $15 = 5$ may also be expressed: $15 \div 3 = 5$, or $3\overline{)15}$. $3\overline{)15}$ is read " 15 divided by 3 equals 5."
           5 5

Read the following and solve:

$\frac{1}{2}$ of $12 = ?$	$12 \div 2 = ?$	$2\overline{)12} = ?$	$\frac{1}{2}$ of $16 = ?$	$2\overline{)16} = ?$
$\frac{1}{2}$ of $8 = ?$	$8 \div 2 = ?$	$2\overline{)\ 8} = ?$	$\frac{1}{3}$ of $15 = ?$	$3\overline{)15} = ?$
$\frac{1}{3}$ of $9 = ?$	$9 \div 3 = ?$	$3\overline{)\ 9} = ?$	$\frac{1}{4}$ o$^{\cdot}$ $16 = ?$	$4\overline{)16} = ?$

EXERCISE.

20. Give each answer in a statement.

1. At 4 cents a yard, what will 3 yards of ribbon cost?

   3 yards of ribbon, at 4 cents a yard, will cost 12 cents.

2. There are 3 rows of trees in my yard; in each row there are 6 trees; how many trees are there in the yard?

3. Henry rode 9 miles in the morning, and 4 miles in the afternoon; how many miles did he ride in all?

4. The sum of two numbers is 8; one of the numbers is 2; what is the other number?

5. The sum of two numbers is 14; one of the numbers is 9; what is the other number?

6. I sold a pint of milk to each of four customers; how many quarts did I sell?

7. Mr. Jones sold six quarts of milk; how many pints did he sell?

8. A square which is 2 inches on each side contains how many square inches?
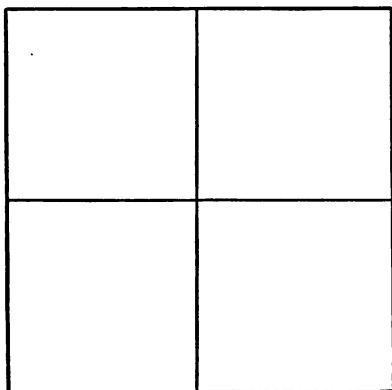
9. How many inches is it around a 2-inch square?

10. An oblong one inch wide and 3 inches long contains how many square inches?
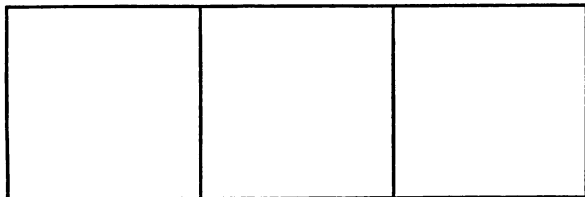
11. What is the distance round an oblong 2 inches wide and 3 inches long?

12. Draw an oblong 2 inches wide and 5 inches long.

13. At 6 cents a yard, how many yards of lace can I buy for 18 cents?

14. John paid 15 cents for 3 pencils; what did one pencil cost?

15. Julia gave away 12 pinks to her sisters, giving 3 to each; how many sisters had she?

16. There are nine boys and 6 girls in Mary's class; how many children are there in the class?

17. George had 15 cents; he spent one-third of his money; how much did he spend?

18. 6 inches is half the length of John's ruler; what is the length of the ruler?

19. 5 cents is one-third of what I paid for a box of berries; what did I pay for the berries?

20. I have 9 cents; how many cents must I add to it to make 15 cents?

NUMBERS FROM TEN TO TWENTY, AS TENS AND ONES

21. NOTE.—Use tooth-picks, shoe-pegs, or any available objects for this illustration work.
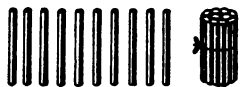
Ten *ones* are one *ten.*

One ten and one one are *eleven.*
    10   and   1   are   11.

One ten and two ones are *twelve.*
    10   and   2   are   12.

One ten and three ones are *thirteen.*
    10   and   3   are   13.

One ten and four ones are *fourteen.*
    10   and   4   are   14.

One ten and five ones are *fifteen.*
    10   and   5   are   15.

One ten and six ones are *sixteen.*
    10   and   6   are   16.

One ten and seven ones are *seventeen.*
    10   and   7   are   17.

One ten and eight ones are *eighteen.*
    10   and   8   are   18.

One ten and nine ones are *nineteen.*
    10   and   9   are   19.

Two tens are *twenty*.

2 tens are 20.

22. 1. Eleven is how many tens and how many ones? Which figure in the number 11 stands for the *one?* Which figure stands for the *one ten?*

2. Write the numbers from one to ten in a column.

3. Write the numbers from ten to twenty in a column.

4. Which figure always stands for the ones, when ones and tens are written? (The right hand figure.)

5. Which figure in the number 18 stands for ones? Which stands for the tens?

6. Which figure stands for the tens in the number 20? Which figure stands for ones? 0 is called *nought* or *zero*.

WRITING NUMBERS TO TEN.

23. The letters I (one), V (five), and X (ten), are also used to represent numbers.

Numbers to 10 are represented in three different ways, as follows:

Words:	zero,	one,	two,	three,	four,	five,	six,	seven,	eight,	nine,	ten.
Figures:	0	1	2	3	4	5	6	7	8	9	10
Letters :		I	II	III	IV	V	VI	VII	VIII	IX	X

THE NUMBERS EIGHTEEN, NINETEEN, AND TWENTY.

24. Write the names of the numbers from one to twenty.

Sums of any two numbers through twenty.

1	2	3	4	5	6	7	8	9
17	16	15	14	13	12	11	10	9
18	18	18	18	18	18	18	18	18

1	2	3	4	5	6	7	8	9
18	17	16	15	14	13	12	11	10
19	19	19	19	19	19	19	19	19

1	2	3	4	5	6	7	8
19	18	17	16	15	14	13	12
20	20	20	20	20	20	20	20

Add these columns, beginning at the top and naming each sum:

9	7	5	8	8	6	4	2	5	4	4	2
6	6	0	5	1	4	8	7	1	2	5	5
1	3	9	1	6	5	1	8	7	5	2	6

2	1	1	2	4	1	3	7	6	7	4	4
8	5	9	4	3	7	9	4	0	6	8	7
7	7	8	7	6	9	4	2	7	6	8	9

6	7	5	9	7	8	8	9	3
6	9	8	6	9	8	6	2	8
8	2	3	2	2	3	6	9	7

7	1	0	1	2	1	1	2	2	3	2
8	1	1	1	0	9	1	1	2	3	5
0	9	8	6	7	5	9	6	7	9	6
1	8	7	5	6	4	7	8	5	3	4

1	3	1	1	1	1	2	2	3	1	2
4	3	4	9	4	4	3	6	8	6	4
8	9	8	6	7	9	8	7	6	9	8
5	4	5	3	4	5	4	3	2	4	3

Add the columns above, beginning at the bottom.

Note.—In addition and all other arithmetical processes, accuracy should be the first consideration. A reasonable degree of rapidity may be acquired by practice.

COMPARISON OF HALVES AND FOURTHS.
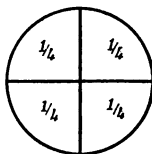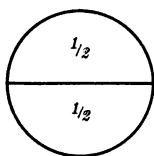
25. 1. A whole melon can be divided into how many halves? How many fourths?

2. Fold a paper square into two equal oblongs. One of the oblongs is what part of the square?

3. Fold the same square into two equal triangles. One of the triangles is what part of the whole square?

4. In one whole there are how many halves?

5. Fold a paper square so as to make four small squares of equal size. One of these small squares is one-fourth of the whole.

In one whole there are how many fourths?

6. One half of the square is how many fourths?

7. If you should fold down one half of the large square, how many fourths would remain?

26. From the circles on page 21, find answers to the following questions:

(1)

$\frac{1}{2} + \frac{1}{2} = ?$

$\frac{1}{4} + \frac{1}{4} = ?$

$\frac{2}{4} + \frac{1}{4} = ?$

$\frac{3}{4} + \frac{1}{4} = ?$

(2)

$\frac{1}{2} - \frac{1}{4} =$ how many fourths?

$\frac{2}{4} - \frac{1}{4} =$ how many fourths?

$\frac{3}{4} - \frac{1}{2} =$ how many fourths?

$\frac{4}{4} - \frac{3}{4} =$ how many fourths?

(3)

$\frac{1}{4}$ is contained in $\frac{3}{4}$, — times.

$\frac{1}{4}$ is contained in $\frac{4}{4}$, — times.

$\frac{1}{2}$ of $\frac{1}{2} =$ how many fourths?

$\frac{1}{4} \times 4 =$ how many fourths?

$\frac{1}{4} \times 3 =$ how many fourths?

4. Frank has half an orange, and Edwin one-fourth of an orange; they both together have — fourths of the orange.

5. George ate one-fourth of a pie; there were remaining — — of the pie.

6. There are three-fourths of a bushel of apples in one barrel, and one-fourth in another; in both barrels there is —.

7. Jennie had an apple and gave away one-fourth of it; she had   left.

EXERCISE.

27. Write the answers in statements.

1. Frank has 8 pigeons, 3 red birds, and 4 canaries; how many birds has he?

Frank has 15 birds.

2. Helen used 16 eggs in making 4 cakes; how many eggs did she put into each cake?

3. Mary drew four leaves on each of the four sides of her box; how many leaves did she draw?

4. Fanny had 19 shells; before she reached home she lost 5 of them; how many had she left?

5. Jennie sewed 6 buttons on her shoes, and had 9 buttons left; how many had she at first?

6. Each of my 3 brothers gave me 6 cents; how much money did all give me? ·

7. At 15 cents a yard, what must I pay for one-third of a yard of ribbon?

8. After spending 10 cents for paints, Frank had 5 cents left; how much money had he at first?

9. When milk is 6 cents a quart, how much must you pay for a pint?

10. Four children each spent 5 cents for car-fare; how much money did they all spend?

11. 18 boys were coasting; there were three boys on each sled; how many sleds were there?

| | | | | | | | | | | | | | | | | | | Read the problem and
the answer from the pic-
☐ ☐ ☐ ☐ ☐ ☐ ture.

12. At 3 cents each, how many pencils can I buy for 18 cents?

13. At 3 cents a pint, what will 4 pints of milk cost?

14. 4 pints are how many quarts?

15. 12 pints are how many quarts?

16. Draw an oblong 3 inches by 4 inches; how many square inches are there in the surface?

17. Divide an apple equally among 4 boys; what part does each boy receive?

18. George divided a melon into four equal parts, and gave away three of the parts; what part of the melon did he keep for himself?

19. Henry wishes to visit his cousin who lives 17 miles away; after riding 8 miles how much farther has he to go?

20. Anna, Carl, and Fred went nutting and gathered 12 quarts of nuts; if they divided them equally, what part did each receive?

CHAPTER II.

NUMBERS FROM TWENTY TO ONE HUNDRED, AS TENS AND ONES.

28. Write the numbers from ten to twenty.

Which figures always stand for ones?

Two tens are *twenty*—20.

Three tens are *thirty*—30.

Four tens are *forty*—40.
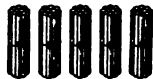
Five tens are *fifty*—50.

Six tens are *sixty*—60.

Seven tens are *seventy*—70.

Eight tens are *eighty*—80.

Nine tens are *ninety*—90.
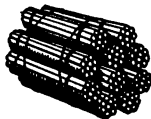
Ten tens are *one hundred*—100.

29. Two tens and one *one* are *twenty-one*—21.

Two tens and two ones are *twenty-two*—22.

Two tens and three ones are *twenty-three*—23.

Two tens and four ones are *twenty-four*—24.

Two tens and five ones are *twenty-five*—25.

Two tens and six ones are *twenty-six*—26.

Two tens and seven ones are *twenty-seven*
—27.

Two tens and eight ones are *twenty-eight*
—28.

Two tens and nine ones are *twenty-nine*
—29.

Three tens are *thirty*—30.

30. 1. Count by ones from thirty to forty.

2. Read these numbers: 31, 32, 33, 34, 35, 36, 37, 38, 39, 40.

3. Write the above numbers in a column and name the ones.

4. Read the following numbers:

40	50	60	70	80	90
41	51	61	71	81	91
42	52	62	72	82	92
43	53	63	73	83	93
44	54	64	74	84	94
45	55	65	75	85	95
46	56	66	76	86	96
47	57	67	77	87	97
48	58	68	78	88	98
49	59	69	79	89	99
					100

5. How many ones are there in 69?   How many tens and how many ones in 69?

6. Which is more, 83 or 74?   92 or 89?

7. Arrange these numbers in order: 70, 65, 69, 67, 66, 64, 68.

8. Arrange these in order: 81, 79, 83, 78, 80, 82, 77.

WRITING NUMBERS FROM TEN TO THIRTY.

31. Numbers from 10 to 30 are represented by words, figures and Roman characters, as follows:

Ten	Eleven	Twelve	Thirteen	Fourteen	Fifteen	Sixteen
10	11	12	13	14	15	16
X	XI	XII	XIII	XIV	XV	XVI

Seventeen	Eighteen	Nineteen	Twenty	Twenty-one
17	18	19	20	21
XVII	XVIII	XIX	XX	XXI

Twenty-two	Twenty-three	Twenty-four	Twenty-five	Twenty-six
22	**23**	**24**	**25**	**26**
XXII	XXIII	XXIV	XXV	XXVI

Twenty-seven	Twenty-eight	Twenty-nine	Thirty
27	**28**	**29**	**30**
XXVII	XXVIII	XXIX	XXX

The Roman characters are not now employed in number work, but are chiefly used for numbering chapters and lessons. They are used also to indicate the different volumes of a series of books, and to mark the hours on the dials of clocks and watches.

Write the numbers 31 to 39 in Roman characters.

Read the following:

VII	XIX	XV	XVI	XVIII
IX	XXIX	XXV	XXIV	XXIII
XI	XXXIX	XXXV	XXXVII	XXXIV

ADDITION AND SUBTRACTION.

32. Give sums at sight, adding by tens:

Thus, in adding 20 and 12 say: 20 and 10 are 30, and 2 are 32.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
20	30	40	50	60	70	80
12	12	12	12	12	12	12

(8)	(9)	(10)	(11)	(12)	(13)	(14)
21	31	41	51	61	71	81
12	12	12	12	12	12	12

(15)	(16)	(17)	(18)	(19)	(20)	(21)
21	31	41	51	61	71	81
14	14	14	14	14	14	14

(22)	(23)	(24)	(25)	(26)	(27)	(28)
24	34	44	54	64	74	84
15	15	15	15	15	15	15

Add the same numbers, giving the sum of the ones and then the sum of the tens.

33. Add 12, 49, and 33.

12	Add the *ones* first, naming results only; thus: 3, 12,
49	14 ones (1 ten and 4 ones). Write the 4 ones in
33	ones' place below the line, and add the 1 ten with
	the tens. 4, 8, 9 tens. Write 9 tens in tens' place.
94	The sum is 94.

Copy and add:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
12	25	36	44	16	29	34	28	25	19
14	10	11	14	25	16	23	16	26	52
16	12	14	10	12	11	39	51	33	22

(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
28	39	28	18	29	67	58	45	19	35
16	14	26	54	14	17	13	16	52	13
2	3	13	17	23	2	4	14	26	48

(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)
19	17	25	38	48	36	14	12	25	24
26	26	10	25	11	14	28	27	31	12
31	33	29	31	26	35	31	28	47	45

(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)
23	28	14	22	42	41	32	21	84	21
10	10	15	18	15	25	14	39	13	37
28	25	22	37	36	37	47	18	26	19

34. Find differences, subtracting by tens:

Thus, in subtracting 12 from 36, say: 36 less 10 = 26 ; 26 less 2 = 24.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
36	47	58	69	75	86	94
10	10	10	10	10	10	10

(8)	(9)	(10)	(11)	(12)	(13)	(14)
36	47	58	69	75	86	94
12	12	12	12	12	12	12

(15)	(16)	(17)	(18)	(19)	(20)	(21)
36	47	58	69	75	86	94
14	14	14	14	14	14	14

(22)	(23)	(24)	(25)	(26)	(27)	(28)
36	47	58	69	75	86	94
20	20	20	20	20	20	20

(29)	(30)	(31)	(32)	(33)	(34)	(35)
46	65	79	54	93	88	37
22	22	22	22	22	22	22

(36)	(37)	(38)	(39)	(40)	(41)	(42)
57	49	65	74	87	95	46
23	23	23	23	23	23	23

(43)	(44)	(45)	(46)	(47)	(48)	(49)
64	75	39	88	95	57	46
24	24	24	24	24	24	24

QUARTS AND GALLONS.

QUART.　　　　　GALLON.

35. 1. It takes 4 quarts to fill a gallon measure; one quart is what part of a gallon?

2. Two quarts are what part of a gallon?

3. Eight quarts are how many gallons?

4. Two gallons are how many quarts?

5. Five quarts are how much more than a gallon?

6. A gallon and two quarts are how many quarts?

7. I bought a gallon of milk on Tuesday, and half a gallon on Wednesday; how many quarts did I buy?

8. A man sells a quart of milk to each of ten customers; how many gallons does he sell?

9. Sixteen quarts are how many gallons?

10. Two and one-half gallons are how many quarts?

> 2 pints (pt.) = 1 quart (qt.).
> 4 quarts   = 1 gallon (gal.).

MULTIPLICATION AND DIVISION.

36.   REVIEW.

(1)	(2)	(3)	(4)
$1 \times 2 = ?$	$6 \times 2 = ?$	$2 \div 2 = ?$	$12 \div 2 = ?$
$2 \times 2 = ?$	$7 \times 2 = ?$	$4 \div 2 = ?$	$14 \div 2 = ?$
$3 \times 2 = ?$	$8 \times 2 = ?$	$6 \div 2 = ?$	$16 \div 2 = ?$
$4 \times 2 = ?$	$9 \times 2 = ?$	$8 \div 2 = ?$	$18 \div 2 = ?$
$5 \times 2 = ?$	$10 \times 2 = ?$	$10 \div 2 = ?$	$20 \div 2 = ?$
$2 \times 1 = ?$	$2 \times 6 = ?$	$6 \div 3 = ?$	$12 \div 6 = ?$
$2 \times 3 = ?$	$2 \times 7 = ?$	$10 \div 5 = ?$	$14 \div 7 = ?$
$2 \times 4 = ?$	$2 \times 9 = ?$	$16 \div 8 = ?$	$18 \div 9 = ?$
$2 \times 5 = ?$	$2 \times 10 = ?$	$8 \div 4 = ?$	$20 \div 10 = ?$

37. Copy and learn:

$$11 \times 2 = 22 \qquad 22 \div 2 = 11$$
$$12 \times 2 = 24 \qquad 24 \div 2 = 12$$

$$2 \times 11 = 22 \qquad 22 \div 11 = 2$$
$$2 \times 12 = 24 \qquad 24 \div 12 = 2$$

EXERCISE.

38. 1. At 2 cents each, what will 11 pen-holders cost?

$$2 \text{ cents} \times 11 = 22 \text{ cents}$$
11 pen-holders will cost 22 cents.

2. If a man earns 2 dollars a day, how much will he earn in 12 days?

3. Mary wishes to buy some flowers for her mother's

birthday; if she buys pinks at 2 cents apiece, how many can she buy for 22 cent.?

$$22 \text{ cents} \div 2 \text{ cents} = 11$$

Mary can buy 11 pinks.

Read the problem, and give the answer from the picture.

4. At 2 cents each, how many pencils can you buy for 24 cents?

39.   REVIEW.

(1)	(2)	(3)	(4)
$2 \times 3 = ?$	$5 \times 3 = ?$	$6 \div 3 = ?$	$12 \div 3 = ?$
$3 \times 3 = ?$	$3 \times 5 = ?$	$9 \div 3 = ?$	$15 \div 3 = ?$
$4 \times 3 = ?$	$6 \times 3 = ?$	$18 \div 3 = ?$	$15 \div 5 = ?$
$3 \times 4 = ?$	$2 \times 6 = ?$	$6 \div 2 = ?$	$12 \div 4 = ?$

40. Copy and learn:

$7 \times 3 = 21$	$10 \times 3 = 30$	$21 \div 3 = 7$	$30 \div 3 = 10$
$8 \times 3 = 24$	$11 \times 3 = 33$	$24 \div 3 = 8$	$33 \div 3 = 11$
$9 \times 3 = 27$	$12 \times 3 = 36$	$27 \div 3 = 9$	$36 \div 3 = 12$
$3 \times 7 = 21$	$3 \times 10 = 30$	$21 \div 7 = 3$	$30 \div 10 = 3$
$3 \times 8 = 24$	$3 \times 11 = 33$	$24 \div 8 = 3$	$33 \div 11 = 3$
$3 \times 9 = 27$	$3 \times 12 = 36$	$27 \div 9 = 3$	$36 \div 12 = 3$

EXERCISE.

41. In the written work, give figures and statements.

1. John bought 7 peaches and paid 3 cents apiece; how much money did he spend?

   3 cents $\times$ 7 = 21 cents.   John spent 21 cents.

2. At 3 cents each, how many oranges can I buy for 24 cents?   (Make a picture.)

3. What will 9 chairs cost, at 3 dollars each?

4. How long does it take a man to earn 27 dollars, if he earns 3 dollars a day?

5. In going to school and returning, George walks 3 miles each day; how far does he walk in 12 days?

6. Helen learned 3 new words each day for 11 days; how many words did she learn?

7. Make problems for:

$7 \times 3 = 21$	$18 \div 3 = 6$	$6 \times 3 = 18$
$9 \times 3 = 27$	$12 \times 3 = 36$	$12 \times 2 = 24$
$24 \div 3 = 8$	$33 \div 3 = 11$	$18 \div 2 = 9$

NOTE.—This work should be done in the recitation period and under the direction of the teacher, the children first laying out the objects for each problem, or making the picture.

8. Write the multiplication table of 3's from 2×3 to 12×3.

9. Recite the table of 3's from memory.

10. Write the table from 3×2 to 3×12, and recite it.

11. Beginning with 3, count by 3's to 36.

12. Beginning with 36, subtract by 3's to 0.

42. Copy and learn:

2×4= 8	5×4=20	8×4=32	11×4=44
3×4=12	6×4=24	9×4=36	12×4=48
4×4=16	7×4=28	10×4=40	

Write these by placing 4 first.   Thus, 4×2= 8,
<div align="right">4×3=12, etc.</div>

Recite the division table, from the multiplication table.

Thus,   2×4=8; 8÷4=2,   3×4=12; 12÷4=3,
<div align="center">and 8÷2=4.   and 12÷3=4, etc.</div>

<div align="center">

EXERCISE.

</div>

43.   *Twelve things make a dozen.*

1. How many cakes can be made from a dozen eggs, if 4 eggs are used for each cake?

2. If there are 4 desks in a row, how many desks are there in 7 rows?

3. At 4 dollars each, what will 8 hats cost?

4. How many gallon measures can be filled from a can which holds 36 quarts?

5. What will 12 chairs cost, at 4 dollars each?

6. Frank is 32 miles away from home; if he walks at the rate of 4 miles an hour, how long will he be in reaching home?

7. I put 28 quarts of oil into lamps holding 4 quarts each; how many lamps can I fill?   (Make a picture.)

8. 9 gallons are how many quarts?

9. How many quart cans will be needed to hold 9 gallons of maple molasses?

10. Make problems for:

$$6\times4=24 \qquad 9\times4=36 \qquad 48\div4=12$$
$$11\times4=44 \qquad 8\times4=32 \qquad 28\div4=\ 7$$
$$40\div4=10 \qquad 36\div4=\ 9 \qquad 7\times4=28$$

NOTE.—This should be done in class.

11. Begin with 4 and count by 4's to 48.

12. Begin with 48 and subtract by 4's to 0.

13. Give answers at sight:

Thus: 7 multiplied by 4 equals 28.

7×4	12×4	7×3	11×4	12×3	$3\times\ 9$	4×12	$3\times\ 7$
9×3	8×3	6×4	9×2	9×4	3×12	$3\times\ 8$	3×11
6×3	8×4	12×2	9×3	9×3	$2\times\ 9$	$4\times\ 7$	4×11

14. Among how many boys can 12 oranges be divided, if each boy receives 4 oranges?

This result may be stated in two ways:

12 oranges $\div$ 4 oranges $=3$; or, 4 oranges$)\overline{12 \text{ oranges}}$
$$\phantom{4 \text{ oranges}})\underline{\phantom{12 \text{ oran}}}3$$

They can be divided among 3 boys.

15. Read at sight:

4 apples$)\overline{24 \text{ apples}}$ 4 roses$)\overline{48 \text{ roses}}$ 3 books$)\overline{36 \text{ books}}$
$$\qquad\qquad 6 \qquad\qquad\qquad — \qquad\qquad\qquad —$$

4 nails$)\overline{36 \text{ nails}}$ 3 pencils$)\overline{21 \text{ pencils}}$ 4 gallons$)\overline{44 \text{ gallons}}$
$$\qquad — \qquad\qquad\qquad — \qquad\qquad\qquad —$$

4 pints$)\overline{32 \text{ pints}}$ 3 lemons$)\overline{24 \text{ lemons}}$ 3 dollars$)\overline{27 \text{ dollars}}$
$$\qquad — \qquad\qquad\qquad — \qquad\qquad\qquad —$$

Finding One of the Equal Parts of a Number.

44. I wish to divide 21 nuts equally among three children; how many nuts will each receive?

We count off one to each child in turn, until we have given away all the nuts.

First child,

Second child,

Third child,

$\frac{1}{3}$ of 21 nuts is 7 nuts.

Each child will receive 7 nuts.

EXERCISE.

45. 1. Divide 21 apples equally among 3 children. How many apples will each receive? (Make a picture, and give figures and statement.)

2. Divide 27 shells equally among 3 children; how many will each receive?

3. Divide 28 roses equally among 4 sisters; how many will each receive?

4. A gardener takes 24 plants to market and sells one-third of them; how many does he sell?

5. Frank had 30 cents and spent $\frac{1}{3}$ of his money for a top; how many cents did he spend?

6. Divide 23 apples equally between two boys. How many will each receive?

> First boy, ◯◯◯◯◯◯◯◯◯◯◖
> Second boy, ◯◯◯◯◯◯◯◯◯◯◖
> ½ of 23 apples equals 11½ apples.
> Each boy receives 11½ apples.

7. Henry paid 25 cents for two pounds of butter; what is the cost of one pound?

8. Divide 21 pears equally among 4 children. What part of all the pears will each receive?

How many pears will each receive? (Make a picture.)

9. I had 40 cents and spent ¼ of it for a yard of muslin; how much did I spend?

10. John has a tape measure 36 inches in length; one-third of the measure is how many inches?

11. If I divide a melon among three boys, so that their shares are equal, what part of the melon does each boy receive?
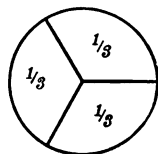
12. Divide 16 cakes equally among 3 playmates; how many cakes will each receive?

> First, ◯ ◯ ◯ ◯ ◯ ◇
> Second, ◯ ◯ ◯ ◯ ◯ ◇
> Third, ◯ ◯ ◯ ◯ ◯ ◇

13. Find ⅓ of 10, 15, 16, 18, 19, 21, 24, 25, 28 and 36.
14. Find ½ of all numbers from 12 to 25.
15. Find ¼ of 16, 17, 20, 21, 24, 28, 32 and 36.

16. Make problems for:

$\frac{1}{3}$ of 15 = 5	$\frac{1}{4}$ of 24 = 6	$\frac{1}{3}$ of 21 = 7
$\frac{1}{3}$ of 18 = 6	$\frac{1}{3}$ of 30 = 10	$\frac{1}{3}$ of 19 = 6$\frac{1}{3}$

NOTE.—To be done in class.

Here are two ways by which we may express the finding of one of the three equal parts of 18 dollars.

$\frac{1}{3}$ of 18 dollars = 6 dollars.

$$3)\overline{18 \text{ dollars}}$$
$$6 \text{ dollars}$$

17. Give answers at sight:

$$3)\overline{18 \text{ cents}}$$
cents

$$4)\overline{36 \text{ inches}}$$
inches

$$3)\overline{28 \text{ pencils}}$$
pencils

$$2)\overline{24 \text{ apples}}$$
apples

$$3)\overline{30 \text{ yards}}$$
yards

$$4)\overline{32 \text{ roses}}$$
roses

$$3)\overline{21 \text{ nuts}}$$
nuts

$$2)\overline{25 \text{ apples}}$$
apples

$$4)\overline{48 \text{ dollars}}$$
dollars

46.   REVIEW.

1×2 = 2	1×3 = 3	1×4 = 4
2×2 = 4	2×3 = 6	2×4 = 8
3×2 = 6	3×3 = 9	3×4 = 12
4×2 = 8	4×3 = 12	4×4 = 16
5×2 = 10	5×3 = 15	5×4 = 20
6×2 = 12	6×3 = 18	6×4 = 24
7×2 = 14	7×3 = 21	7×4 = 28
8×2 = 16	8×3 = 24	8×4 = 32
9×2 = 18	9×3 = 27	9×4 = 36
10×2 = 20	10×3 = 30	10×4 = 40
11×2 = 22	11×3 = 33	11×4 = 44
12×2 = 24	12×3 = 36	12×4 = 48

Write these tables with the 2's, 3's and 4's first.

47. 1. On Monday Albert had 30 cents in his savings bank; on Tuesday he earned 10 cents by selling papers. How much money had he then?

2. George had 24 cents and spent 6 cents for an orange; how many cents had he left?

$$24 \text{ cents} - 6 \text{ cents} = 18 \text{ cents.}$$
George had 18 cents left.

3. Frank paid 24 cents for a kite and 6 cents for a top; how much more did he pay for the kite than for the top?

24 cents − 6 cents = 18 cents.

Frank paid 18 cents more for the kite than for the top.

4. Robert had 3 dozen nails and gave one dozen to Henry; how many dozen had he left? How many nails had he left?

5. Margaret gathered 28 pond-lilies and Mabel gathered 10; how many did both gather?

6. A boy having 40 cents, paid 8 cents for a ball; how many cents had he then?

7. Grace wrote 11 lines in her copy-book on Monday, 6 on Tuesday and 3 on Wednesday; how many lines did she write in all?

8. Mary wishes to buy a picture which costs 25 cents; she has only 10 cents. How many more cents must she have to buy the picture?

9. One week a chair-maker made 2 dozen parlor chairs and 8 office-chairs. How many chairs did he make in the week?

10. Alfred had 40 cents; he paid 9 cents for pencils; how many cents had he then?

11. A grocer bought 4 dozen boxes of strawberries; he sold one dozen boxes. How many boxes had he left?

12. Eight gallons are how many quarts?

13. If 8 quarts of cider are sold from an 8-gallon cask, how many quarts are left?

CHAPTER III.

READING AND WRITING NUMBERS: HUNDREDS

One Hundred to Five Hundred.

48. Take counters and find 1 hundred, 2 tens, 4 ones. Write the number.

NOTE.—Use toothpicks or shoe-pegs, as heretofore suggested.

Find with the counters and write:

1 hundred, 3 tens, 7 ones.				1 hundred, 9 tens, 0 ones.					
1	"	5	"	6	"	1	"	6 " 5 "
1	"	8	"	3	"	1	"	1 " 1 one.

How many ones are there in the first number? How many ones in each of the other numbers?

Begin with 1 hundred, and write in figures all the numbers through 1 hundred, 9 tens, and 9 ones.

Add 1 to 199; how many tens have you? How many ones? Write the number.

49. What does the figure 4 mean in the number 134? Because the figure 4 means 4 ones, it is written in *ones' place*. For what do the 6, 9, and 8 stand?

134
216
159
178

5 and 7 stand for what? They are written in *tens' place*.

The figure 1 in the first number means what? The figure 2 in the second number means what?

Because the figure 1 means one hundred, it is written in *hundreds' place.* In what place is the figure 2 written?

Hundreds are always written in hundreds' place, tens in tens' place, and ones in ones' place.

Period of ones.		
Hundreds' place.	Tens' place.	Ones' place.
1	3	4
2	1	6
1	5	9

Ones' place, tens' place, and hundreds' place make *the period of ones.*

50. 1. Copy and read these numbers:

124	101	116	173	119	112
186	111	105	113	191	121
210	198	115	131	109	200
181	106	137	103	129	201

2. Find with the counters and write the numbers from 200 to 300.

3. Write in figures:

2 hundreds, 5 tens, 3 ones.   3 hundreds, 0 tens, 0 ones.

4   "   6 " 7 "   3   "   2 " 2 "

3   "   7 " 9 "   5   "   0 " 0 "

4. The first number equals how many ones?

5. Which is greater, 3 hundred or 3 tens?

6. 5 hundred is how many more than 3 hundred?

7. Read the following:

311	222	202	314	384	404
210	333	212	341	448	401
413	331	221	413	444	309
125	313	211	431	414	319

8. 414 is how many more than 313?   330 is how many more than 230?   450 is how many less than 500?

Five Hundred to One Thousand.

51. 1. Find with the counters 5 hundreds, 9 tens, and 9 ones. Add one *one*. How many hundreds have you?

2. Write in figures 6 hundreds. Write 6 hundreds, 4 tens; 6 hundreds, 5 tens, and 2 ones.

3. Find 7 hundreds. Write the number in figures.

4. Read:

643	611	721	505	707	606
751	610	712	689	770	660
589	601	702	799	777	666

5. Which is the greater number, 659 or 569? 697 or 769? 571 or 751?

6. Find 8 hundreds, 8 tens, and 8 ones.

7. Find 9 hundreds, and represent the number by figures.

8. Find 9 hundreds, 9 tens, and 9 ones.

9.-Read:

845	984	901	991	999	880
862	936	909	919	808	881
933	847	990	900	888	818

52. The greatest number that can be expressed by three figures is 999.

Add 1 to 999; how many hundreds have you? Ten hundreds make 1 thousand.

The number one thousand is expressed by writing the figure 1 in thousands' place, to the left of the hundreds; thus, 1,000.

Ten hundreds equal *one* thousand.

ADDITION. .

EXERCISE.

53. (*a*) Add at sight, naming each sum:

(*b*) Copy and find the answers:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
31	27	20	11	12	31	51	12	32
21	18	31	41	50	19	21	41	12
29	40	28	16	17	25	19	16	27
38	31	27	25	16	34	17	18	15

(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
23	12	13	51	31	61	41	32	62
23	25	23	14	29	14	24	43	16
19	16	39	18	46	17	59	58	17
23	44	24	25	43	24	35	14	53

(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)
13	51	82	13	41	79	54	8	14
58	36	14	48	36	10	26	25	36
66	49	28	66	49	28	7	92	27
42	34	43	43	34	43	53	14	82

(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)
79	99	89	38	38	97	38	56	2
13	03	13	04	16	49	17	57	12
66	25	25	72	72	21	82	23	49
21	51	41	62	52	11	41	41	63
11	11	12	13	12	11	12	11	93

(37)	(38)	(39)	(40)	(41)	(42)	(43)	(44)	(45)
76	36	55	·51	50	98	71	72	34
64	34	24	34	59	57	15	45	75
23	73	75	72	34	12	64	41	22
12	33	21	14	31	12	25	16	12
12	11	11	19	11	10	19	15	57

54. Finding the sum of two or more numbers is called **Addition**.

The sign of addition (+) is called *plus*. The numbers between which it 's placed are to be added. 8+6=14 is read, " 8 plus 6 equals 14."

SUBTRACTION.

55. 1. The sum of two numbers is 14; one of the numbers is 8.   What is the other number?

2. The sum of two numbers is 30; one of the numbers is 5.   What is the other number?

3. Separate 40 into two equal parts, and take out one of the parts; what remains?

4. From 40 take 27.

5. What are the two parts of 40 in problem 4?

6. Subtract at sight:

40	40	50	60	85	75	60	95	88
20	10	20	12	15	5	30	12	14

7. Read answers, subtracting *ones* first:

126	138	146	137	129	158	169	187
5	4	3	4	6	5	7	4

8. 42 is part of 161. If we subtract 42 from 161, what remains?

Write *ones* under ones, *tens* under tens. (Place the bundles of sticks, 1 hundred, 6 tens, 1 one, over the figures 161.)

<table>
<tr><td>5   10</td><td rowspan="3"></td></tr>
<tr><td>1   6̸   1</td></tr>
<tr><td>   4   2</td></tr>
<tr><td>1   1   9</td></tr>
</table>

Subtract *ones* first. 2 ones cannot be taken out of 1 one. Take 1 ten from the tens, leaving 5 tens. (Show with the sticks.)

The 1 ten which we have taken is equal to 10 ones, which we add to the 1 one to make 11 ones. 2 ones from 11 ones leave 9 ones. 9 is written in ones' place below the line. 4 tens from 5 tens leave 1 ten, which is written in tens' place below the line. No hundreds from 1 hundred leave 1 hundred, which is written in hundreds' place below the line.

119 is the part of 161 which we wished to find.

The two parts, 42 and 119, make what number?

EXERCISE.

56. Subtract:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
171	281	261	252	263	361	260	392
32	42	34	26	35	28	44	58

(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
391	282	271	390	471	392	282	373
54	68	69	72	54	75	67	58

(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
184	153	174	183	168	173	163	177
45	35	146	156	59	49	138	148

(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
340	265	292	290	156	182	280	180
123	48	147	137	49	55	168	146

(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)
291	294	162	161	165	261	183	190
44	58	136	138	59	48	157	129

(41)	(42)	(43)	(44)	(45)	(46)	(47)	(48)
290	192	191	187	281	191	271	288
74	89	168	158	67	69	136	169

(49)	(50)	(51)	(52)	(53)	(54)	(55)	(56)
294	390	295	365	293	372	281	390
69	85	147	148	175	148	167	178

(57)	(58)	(59)	(60)	(61)	(62)	(63)	(64)
204	312	315	305	206	304	305	306
141	191	184	144	156	142	143	164

(65)	(66)	(67)	(68)	(69)	(70)	(71)	(72)
300	216	321	222	311	214	304	301
85	97	84	74	94	65	68	192

NOTE.—Just as soon as possible have the pupils subtract without rewriting the minuend.

57. Taking a part of a number out of it, to find the remainder, is called **Subtraction**.

The number to be diminished by taking one of the parts is called the **Minuend**.

The part taken out of the minuend is called the **Subtrahend**; the part left is called the **Remainder**.

The sign of subtraction ($-$) is called *minus* or *less*. $14-6=8$ is read, "14 minus 6 equals 8"; it means that **14** diminished by 6 equals 8.

INCH, FOOT AND YARD.

One Inch.
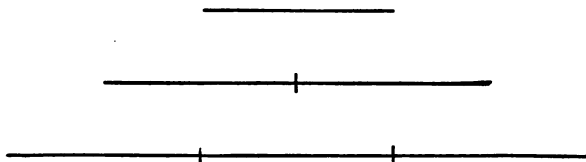
58. What is the length of the first line?   Of the second?

The length of the first line is what part of the length of the second?

The second line is what part of the third?

Cut a piece of paper 12 inches long and 1 inch wide. Draw a line 12 inches long.

12 inches make a measure that is called one ——.

How many six-inch sticks of candy can you cut from a stick 12 inches long?   How many 3-inch sticks?

3 inches are what part of a foot?

How many 4-inch lead-pencils can be made from a piece of lead 12 inches long?

4 inches are what part of a foot?   8 inches?   One inch?

How many feet are there in fifteen inches?   In eighteen?

59. Draw a line 3 feet long.   *Three feet make one yard.*

Mention some things that are sold by the yard.

How many inches are there in one yard?   1 foot is what part of a yard?

½ a yard is how many inches?   How many feet?

¼ of a yard is how many inches?   ⅛ of a yard?

12 inches are what part of a yard?   4½ inches?

Ella has a yard of silk with which to dress 4 dolls for the fair.   What part of the silk will she use for each dress, if she divides it equally?   How many inches for each?

If a yard of ribbon is divided for badges equally among 6 boys, what will be the length of each piece?

In 2 yards there are how many feet?   In 3 yards?   How many half yards in 2 yards?   How many in 3 yards?

60. How many feet tall are you?   What is the height of the teacher's table from the floor?   (Estimate first, and then measure.)   What is the length of the table?

How far is it from the top of your desk to the floor? What is the height of the transom from the floor?   Width of window-sash?   Height of the clock from the floor? Length, in feet, of front blackboard?   Length of room? Width of room?

Tie a knot for every foot in a piece of twine 6 feet long. Tie a double knot for every yard.

Estimate length, width, and height of things outside of the schoolroom, and then measure: height of a barrel; of a common wooden bucket; length of an ear of corn.

$$12 \text{ inches (in.)} = 1 \text{ foot (ft.)}.$$
$$3 \text{ feet} \qquad = 1 \text{ yard (yd.)}.$$

MISCELLANEOUS PROBLEMS.

61. 1. At 10 cents each, how many pineapples can you buy for 30 cents?

2. Mary wishes to plant some pinks in a triangular garden bed.   How many plants will she use, if she plants 10 on each of the 3 sides?   (Picture.)

3. How many 5-cent pieces make 30 cents?

4. A church is lighted by 8 lamps of 4 burners each. How many burners are there in all?

5. George planted some hyacinth bulbs in 6 boxes, planting 4 bulbs in each box. How many did he plant in all?

6. A boy walks 10 squares in 30 minutes. At that rate, how long is he in walking one square?

7. I bought 4 verbenas for 32 cents. What did each plant cost, if they are of equal value?

8. Ella found 4 eggs each day for a week; how many did she find?

9. How many petals have 8 violets, if each flower has 5 petals?

10. John worked four weeks. How many days did he work?

11. How much money did John earn if he earned a dollar each working day?

12. Eleanor had 3 dimes; she spent 6 cents for a pencil. How much money had she left?

13. 27 feet is three times the length of a ladder; what is its length?

14. Mary made 25 sponge-cakes; she divided them equally among 5 brothers and sisters; how many did each receive?

15. Divide 30 crackers equally among 5 boys.

16. At 12½ cents a can, what will 2 cans of corn cost?

17. Some children were gathering goldenrod. They found that they had gathered in all 24 branches. They divided them equally and each had 8 branches. How many children were there?

18. I wish to put 36 quarts of milk into cans holding 4 quarts each; how many cans will be needed?

19. Divide 32 quarts of milk equally among 4 customers; how many quarts will each receive?

20. 48 pounds of honey were packed in 4 jars of equal size; how many pounds were in each jar?

21. I bought some muslin for 25 cents and had 25 cents left; how much money had I at first?

22. John bought a pair of skates for 75 cents and sold them for 50 cents.   Did he gain or lose?   How much?

23. Edgar sold a knife for 30 cents; this is 5 cents less than he paid for it.   How much did he pay for the knife?

24. A peck of apples costs 30 cents; I must borrow 5 cents in order to pay for them; how much money have I?

25. At a picnic 44 cups of lemonade were passed to 4 rows of children; how many cups were passed to each row?

26. How long will 48 pounds of butter last, if used at the rate of 4 pounds a week?

27. If you have 40 pansies tied in bunches of 10 each, how many bunches have you?

28. A family used 32 bushels of apples in 8 months; at that rate, how many bushels were used in one month?

29. If 36 tuberoses are planted in 4 equal rows, how many are there in each row?

30. 48 quarts of ice-cream are how many gallons?

31. If Frank and James each can mow the lawn in 2 hours, in how many hours can Frank and James together do the same work? (Will it take a longer or a shorter time?)

32. Grace hemmed six aprons in 4 hours; in how many hours can Grace and Mabel together do the work, if Mabel works as fast as Grace?

33. On a journey of two days, I traveled 28 miles the first day and 67 miles the second day; how many miles did I travel?

34. A man earns 125 dollars in one month and spends 18 dollars for rent and 30 dollars for groceries; how much money has he left?

35. Edna gathered 30 pinks, 42 roses and 24 violets; how many flowers did she gather?

36. Mabel spent 25 cents for some pencils, 15 cents for paper, and 40 cents for a book; how many cents did she spend?

37. Emma spent 5 cents for a pencil and had 42 cents left; how much money had she at first?

38. I bought $\frac{1}{2}$ a yard of velvet and found that I needed $\frac{1}{4}$ of a yard more; how much should I have bought at first?

39. After using $\frac{1}{2}$ a yard of ribbon, I had $1\frac{1}{2}$ yards left; how many yards had I at first?

MEASURING TIME.
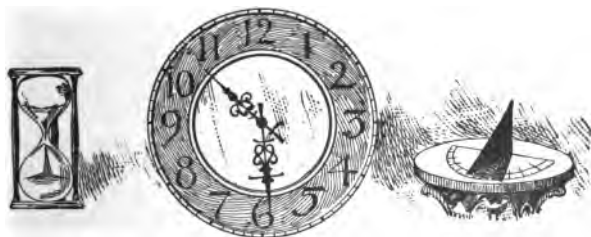
62. Are there any other ways of measuring time than by the clock and the hour-glass? Have you ever seen a sun-dial?

How many minutes is the long hand in passing from one figure to another?

The space between the figures is divided into five equal parts. The long hand is a minute in passing over one of these smallest spaces. See how many times you can walk across the floor in a minute. Sit still and watch the clock a minute; notice how much space the long hand has passed over.

Is any smaller portion of time than a minute measured by the clock? Some clocks tick 60 times in a minute. *Sixty seconds make a minute.*

30 seconds are what part of a minute?

63. How long does it take the minute hand to move entirely round the face of the clock? Count the small spaces on the face of the clock. *Sixty minutes make an hour.*

How many minutes are there in 2 hours? 5 minutes are what part of an hour?

What time is it by the clock on page 53? If the long hand were moved forward to the figure 1, what time would the clock show?

Where will the short hand of the clock point when the minute hand points to 6? Draw a picture of the clock. What time does it show?

How many hours are there from 6 in the morning until noon? How many hours from noon until midnight? *Twenty-four hours make a day.*

64. How many days make a week? How many weeks make a month? Name the months in order. Name those

which have 30 days. How many days are there in February?

60 seconds (sec.)	= 1 minute (min.).
60 minutes	= 1 hour (h.).
24 hours	= 1 day (d.).
7 days	= 1 week (w.).
4 weeks	= 1 month (m.).
12 months ⎫ 365 days ⎬	= 1 year (yr.).

MULTIPLICATION AND DIVISION.

65. Copy and learn:

$5 \times 5 = 25$	$7 \times 5 = 35$	$9 \times 5 = 45$	$11 \times 5 = 55$
$6 \times 5 = 30$	$8 \times 5 = 40$	$10 \times 5 = 50$	$12 \times 5 = 60$

Write the table with the 5's first.

Recite the division table from the multiplication table.

Thus, $25 \div 5 = 5$ $30 \div 6 = 5$, etc.

       $30 \div 5 = 6$

EXERCISE.

66. 1. At 5 dollars a pair, what will 5 pairs of shoes cost?

2. If a family uses 5 pounds of butter in one week, in how many weeks will 30 pounds be used?

3. At 5 cents a pound, how many pounds of sugar can be bought for 45 cents?

4. 40 loaves of bread will last a camping party how many days, if they use 5 loaves a day?

5. At 5 cents a spool, how many spools of thread can be bought for 60 cents?

6. If a yard of cloth costs 5 dollars, what will 7 yards cost?

7. If a man earns 5 dollars a day, how many dollars does he earn in a week, counting 6 working days?

8. Mabel gathered 35 roses which she divided among her friends, giving 5 roses to each; among how many friends did she divide them?

9. At 5 cents a paper, what will a dozen papers of needles cost?

10. If it takes 5 yards of cloth to make a suit of clothes, how many suits can be made from 55 yards?

11. Make problems for:

$9 \times 5 = 45$	5)45	5)35	$8 \times 5 = 40$
$7 \times 5 = 35$	9	7	$6 \times 5 = 30$
$12 \times 5 = 60$	5)55	5)50	$5 \times 6 = 30$
$5 \times 8 = 40$	11	5	$11 \times 5 = 55$

NOTE.—Do this in class.

67. Copy and learn:

$6 \times 6 = 36$	$8 \times 6 = 48$	$10 \times 6 = 60$	$12 \times 6 = 72$
$7 \times 6 = 42$	$9 \times 6 = 54$	$11 \times 6 = 66$	

Write the table with the 6's first.
Recite the division table from the multiplication table.

EXERCISE.

68. 1. How many yards of fringe will be needed for 7 rugs, if 6 yards are used for one rug?

2. When melons are selling for 12 cents each, what will 6 cost?

3. At 6 dollars each, how many flags can be bought for 48 dollars?

4. If I use 6 small flags for decorating one window, how many shall I need for 9 windows?

5. In how many months can I pay for a sewing machine which costs 60 dollars, if I pay 6 dollars a month?

6. How many inches are there in a yard? How many badges 6 inches long can be cut from one yard of ribbon?

7. A merchant sold a dozen silk umbrellas at 6 dollars each; how much money did he receive in payment?

8. At 6 dollars a dozen, what will 5 dozen spoons cost?

9. I received 66 dollars for 11 barrels of apples; how much is that a barrel?

10. If 6 gallons of oil are used in a month, how long will 48 gallons last?

11. Make problems for:

$$9 \times 6 = \qquad 6\overline{)48} \qquad 6\overline{)36} \qquad 11 \times 6 =$$
$$8 \qquad\qquad 6$$
$$12 \times 6 = \qquad 6\overline{)54} \qquad 6\overline{)60} \qquad 7 \times 6 =$$
$$9 \qquad\qquad 12$$

NOTE.—Do this in class.

Finding One of the Equal Parts of a Number.

EXERCISE.

69. 1. If 6 yards of cloth cost 30 dollars, what is the cost of one yard?

2. Frank walks 35 miles in 5 days; at that rate how many miles does he walk in one day?

3. 42 pounds of butter are packed in 6 jars of equal size; how many pounds are put in each jar?

4. I paid 60 cents for a dozen oranges; at that rate, what is the cost of one orange?

5. George planted 45 tulip bulbs in 5 equal rows; how many did he plant n one row?

6. A man earned 72 dollars in 6 weeks; at that rate how much does he earn in one week?

7. Six children were gathering shells; they found that they had gathered 54 in all. If they divided them equally, how many did each child receive?

8. A boy walks 9 squares in 27 minutes; how long is he in walking one square?

9. If 9 pounds of rice cost 72 cents, what is the cost of one pound?

10. A gardener takes 4 dozen plants to market and sells only one-sixth of them; how many plants does he sell?

11. Make problems for:

$\frac{1}{6}$ of $60=10$	$5)\underline{30 \text{ apples}}$	$60 \div 6 = 10$
	6 apples	
$\frac{1}{5}$ of $40=8$	$6)\underline{72 \text{ cents}}$	$42 \div 6 = 7$
	12 cents	
$\frac{1}{6}$ of $54=9$	$5)\underline{60 \text{ yards}}$	$72 \div 12 = 6$
	12 yards	

NOTE.—Do this in class.

70. Copy and complete:

$5 \div 5 = 1$	$8 \div 5 =$	$11 \div 5 =$
$6 \div 5 = 1$, and 1 remaining	$9 \div 5 =$	$12 \div 5 =$
$7 \div 5 = 1$, and 2 remaining	$10 \div 5 =$	$13 \div 5 =$

$14 \div 5 =$	$21 \div 5 =$	$28 \div 5 =$
$15 \div 5 =$	$22 \div 5 =$	$29 \div 5 =$
$16 \div 5 =$	$23 \div 5 =$	$30 \div 5 =$
$17 \div 5 =$	$24 \div 5 =$	$31 \div 5 =$
$18 \div 5 =$	$25 \div 5 =$	$32 \div 5 =$
$19 \div 5 =$	$26 \div 5 =$	$33 \div 5 =$
$20 \div 5 =$	$27 \div 5 =$	$34 \div 5 =$
		$35 \div 5 =$

Divide all numbers from 6 to 36, by 6.

71.   **REVIEW.**

$1 \times 2 = 2$	$1 \times 3 = 3$	$1 \times 4 = 4$
$2 \times 2 = 4$	$2 \times 3 = 6$	$2 \times 4 = 8$
$3 \times 2 = 6$	$3 \times 3 = 9$	$3 \times 4 = 12$
$4 \times 2 = 8$	$4 \times 3 = 12$	$4 \times 4 = 16$
$5 \times 2 = 10$	$5 \times 3 = 15$	$5 \times 4 = 20$
$6 \times 2 = 12$	$6 \times 3 = 18$	$6 \times 4 = 24$
$7 \times 2 = 14$	$7 \times 3 = 21$	$7 \times 4 = 28$
$8 \times 2 = 16$	$8 \times 3 = 24$	$8 \times 4 = 32$
$9 \times 2 = 18$	$9 \times 3 = 27$	$9 \times 4 = 36$
$10 \times 2 = 20$	$10 \times 3 = 30$	$10 \times 4 = 40$
$11 \times 2 = 22$	$11 \times 3 = 33$	$11 \times 4 = 44$
$12 \times 2 = 24$	$12 \times 3 = 36$	$12 \times 4 = 48$

$1 \times 5 = 5$	$7 \times 5 = 35$
$2 \times 5 = 10$	$8 \times 5 = 40$
$3 \times 5 = 15$	$9 \times 5 = 45$
$4 \times 5 = 20$	$10 \times 5 = 50$
$5 \times 5 = 25$	$11 \times 5 = 55$
$6 \times 5 = 30$	$12 \times 5 = 60$

$$1\times6=\ 6 \qquad\qquad 7\times6=42$$
$$2\times6=12 \qquad\qquad 8\times6=48$$
$$3\times6=18 \qquad\qquad 9\times6=54$$
$$4\times6=24 \qquad\qquad 10\times6=60$$
$$5\times6=30 \qquad\qquad 11\times6=66$$
$$6\times6=36 \qquad\qquad 12\times6=72$$

Without rewriting, read these with 2, 3, 4, 5 and 6 first.

72.   ADDITION TABLE.

```
   1     2     3  2     4  3      5  4  3
   1     1     1  2     1  2      1  2  3
  ___   ___   __ __    __ __     __ __ __

  6  5  4    7  6  5  4      8  7  6  5
  1  2  3    1  2  3  4      1  2  3  4
 __ __ __   __ __ __ __     __ __ __ __

     9  8  7  6  5     9  8  7  6
     1  2  3  4  5     2  3  4  5
    __ __ __ __ __    __ __ __ __

  9  8  7  6     9  8  7     9  8  7
  3  4  5  6     4  5  6     5  6  7
 __ __ __ __    __ __ __    __ __ __

        9  8     9  8     9     9
        6  7     7  8     8     9
       __ __    __ __    __    __
```

NOTE.—The 45 sums given above must be learned as the basis for accuracy and rapidity in addition.

73.   SUBTRACTION TABLE.

```
  2     3  3     4  4  4      5  5  5  5
  1     1  2     1  2  3      1  2  3  4
 __    __ __    __ __ __     __ __ __ __
```

```
6   6   6   6   6       7   7   7   7   7   7
1   2   3   4   5       1   2   3   4   5   6
-   -   -   -   -       -   -   -   -   -   -

        9   9   9   9   9   9   9   9
        1  -2   3   4   5   6   7   8
        -   -   -   -   -   -   -   -

10  10  10  10  10  10  10  10  10
 1   2   3   4   5   6   7   8   9
 _   _   _   _   _   _   _   _   _

    11  11  11  11  11  11  11  11
     2·  3   4   5   6   7   8   9
     _   _   _   _   _   _   _   _

        12  12  12  12  12  12  12
         3   4  ·5   6   7   8   9
         _   _   _   _   _   _   _

13  13  13  13  13  13      14  14  14  14  14
 4   5   6   7   8   9       5   6   7   8   9
 _   _   _   _   _   _       _   _   _   _   _

15  15  15  15      16  16  16      17  17      18
 6   7   8   9       7   8   9       8   9       9
 _   _   _   _       _   _   _       _   _       _
```

NOTE.—These 74 primary facts of subtraction should be thoroughly learned. These tables should be frequently reviewed. They should be placed on the board or on a chart so that they may be readily used.

CHAPTER IV.

READING AND WRITING NUMBERS: THOUSANDS.

74. You have learned that the number *one thousand* is expressed by writing the figure 1 to the left of hundreds' place.

Read the following numbers:

| 1,500 | 1,230 | 1,400 | 1,670 | 1,873 | 1,999 |
| 1,220 | 1,864 | 1,748 | 1,976 | 1,449 | 1,650 |

The period of ones is separated from the thousands by a comma.

Write in figures: two thousand, three thousand, five thousand, eight thousand, nine thousand.

Read the following numbers:

3,000	7,000	6,350	4,500	9,400
3,200	5,102	8,008	1,111	0,444
4,340	2,501	8,108	1,001	2,020
8,650	7,206	0,888	1,100	4,009
9,241	7,777	5,230	1,004	9,999

The greatest number that can be expressed by four figures is 9,999.

Write in figures:

Three thousand seven hundred fifty.

Eight thousand two hundred two.

One thousand eleven; one thousand one.

Five thousand five; five thousand fifty.

Four thousand thirty-five; four thousand five.

Express in figures numbers composed of:

0	thousands	6	hundreds	7	tens	and	4	ones.
3	"	3	"	3	"	"	3	"
9	"	8	"	5	"	"	6	"
8	"	0	"	0	"	"	7	"
5	"	9	"	9	"	"	0	"

75. Write one thousand in figures. In what place does the figure 1 stand? If we wish to express a number ten times as great as 1,000, how shall we represent it? One ten-thousand is ten times as great as one thousand. We express the 1 ten-thousand by writing the figure 1 to the left of thousands, in ten-thousands' place; thus, 10,000.

NOTE.—A box of small toothpicks may be used in bundles of tens, hundreds, and thousands, to show the ten-thousand.

1. Write 2 ten-thousands. 2 ten-thousands are how many ones?

2. Write 3 ten-thousands and read the number in two ways. (How many thousands? How many ones?)

3. Read the following numbers:

30,000	25,400	15,021	10,010
50,000	36,303	21,048	11,001
90,000	47,350	16,743	15,005
41,000	54,707	28,096	15,015
65,000	90,900	11,110	99,999

4. How many ones are there in each of the last five numbers?

5. Write the following in figures:

27 thousand 600 ones.	30 thousand 500 ones.
70 thousand 350 ones.	60 thousand 70 ones.
6 thousand 70 ones.	95 thousand 200 ones.
80 thousand 8 ones.	8 thousand 8 ones.

6. Write in figures:

Seventeen thousand seven.   Seventeen thousand seventeen.

Twenty thousand two.

Eighty thousand eighty-one.   Ninety thousand nine.

Twelve thousand twenty-one.   Twelve thousand twelve.

Fifty-six thousand one hundred fifty-six.

Eleven thousand one.

Eleven thousand one hundred ten.   Ten thousand ten.

Eleven thousand eleven.

76.   ROMAN NOTATION.

30	40	50	60	70	80	90	100
XXX	XL	L	LX	LXX	LXXX	XC	C

When a letter is repeated, its value is repeated.

When a letter is placed after one of greater value, its value is added; when placed before, its value is subtracted from the greater.

Express the following numbers by figures:

XXXIX	LIX	XC	XCIX
XLIX	LXV	XCI	XCVIII
XLVIII	LXX	LXXXIX	LXXIX
XIX	XLIV	XCVIII	XLIV
XXIX	LXXX	LXXXVIII	LXVI

Express the following numbers by letters:

45	94	42	49
51	87	58	59
68	61	75	99
73	49	95	83

MULTIPLICATION.

77. Two times 24 cents are how many cents?

2 times $80 = ?

2 times 396 = ?

Two times 6 ones are 12 ones.   12 ones equal 1 ten and 2 ones.   Write the 2 ones in ones' place.

2 times 9 tens are 18 tens ; adding 1 ten we have 19 tens, equal to 1 hundred and 9 tens.   Write 9 tens in tens' place.

$$\begin{array}{r} 396 \\ 2 \\ \hline 792 \end{array}$$

2 times 3 hundreds are six hundreds; adding one hundred we have 7 hundreds, which we write in hundreds' place.

2 times 396 equal 792.

Find the same result by addition, and notice the number of ones added; the number of tens, etc.

396 is called the **Multiplicand;** it is the number to be multiplied.

2 is called the **Multiplier;** it is the number which shows how many times the multiplicand is taken.

792 is called the **Product;** it is the result obtained by multiplying.

The multiplicand and the multiplier are called **Factors** (makers) of the product.

The sign of multiplication is ×, read " multiplied by." 396×2=792 is read, " 396 multiplied by 2 equals 792."

· EXERCISE.

78. 1. If a man travels 96 miles in a day, how far, at that rate, will he travel in 2 days?

<div align="center">

96 miles, distance traveled in 1 day.
　2
───
192 miles, distance traveled in 2 days.

</div>

2. At \$2 a box, what will 87 boxes of lemons cost?

<div align="center">

\$2, cost of 1 box.
　87
───
\$174, cost of 87 boxes of lemons.
87 times \$2 = \$174.

</div>

Multiply 87 by 2, and call the result dollars.

3. What will 126 pairs of shoes cost, at \$2 a pair?

4. If a train runs 328 miles in a day, how far will it run in 2 days?

5. How many feet have 837 men?

6. How many eyes have 918 men?

7. At \$2 a yard, what will be the cost of 528 yards of cloth?

8. What will 929 barrels of apples cost, at \$2 a barrel?

Multiply:

(9)	(10)	(11)	(12)	(13)	(14)	(15)
378	856	504	978	709	768	980
2	2	2	2	2	2	2

(16)	(17)	(18)	(19)	(20)	(21)
309	2023	986	4507	4659	4709
2	2	2	2	2	2

22. 468 multiplied by 2 = ?   25. 349 multiplied by 2 = ?
23. 763   "   2 = ?   26. 786   "   2 = ?
24. 849   "   2 = ?   27. 605   "   2 = ?

DIVISION.

79. How many times can 2 cents be taken out of 50 cents? How many times out of 80 cents? Out of 90 cents?

How many 2's can be taken out of 9 tens 8 ones?

Show with the counters that 45 twos can be taken out of 9 tens, or 90 ones, and that 4 twos can be taken out of 8 ones. 49 twos can be taken out of 9 tens 8 ones.

Show that 9 tens (or 90) hold 2 ones 4 tens (or 40) times, with 1 ten remaining. The 1 ten is equal to 10 ones. 10 ones and 8 ones are 18 ones. 18 ones hold 2 ones 9 times.

How many 2's can be taken out of 972?

2 is contained in 9 hundred 4 hundred times, with   2)972
1 hundred remaining undivided, which is equal to 10   ‾‾‾‾‾
tens.   10 tens and 7 tens are 17 tens.   2 is contained in   486
17 tens 8 tens times, with 1 ten remaining, which is equal to 10
ones.   10 ones and 2 ones are 12 ones.   2 is contained in 12 ones
6 times.   2 can be taken out of 972 486 times, or 486 twos can be
taken out of 972.

How many $2 are there in $972?

At $2 a barrel, how many barrels of potatoes can be bought for $972?

$2) $972
‾‾‾‾‾‾‾‾‾
      486, number of 2-dollars is $972.

486 barrels of potatoes, at $2 a barrel, can be bought for $972.

972 is called the **Dividend.**

2 is called the **Divisor.**

A divisor is called an **Exact Divisor** when it is contained in the dividend without a remainder.

Divide 73 by 2.   2)73
                            ‾‾‾‾‾
                            36—1

      1 is the *remainder* and the division is not *exact*.

486 is called the **Quotient;** it is the result of the division.

The divisor and quotient are **Factors** of the dividend.

The product of the divisor and the quotient, plus the remainder, is equal to the dividend.

In the problem above, 2 is divisor, 36 quotient, and 1 remainder. $36 \times 2 = 72$; $72 + 1 = 73$.   73 is the dividend.

Division is expressed in three ways.   Each of the expressions, $24 \div 2 = 12$, $\frac{24}{2} = 12$, and 2)24, is read, "24 divided by 2 equals 12." $\overline{12}$

80. Divide by 2:

1. 7398	4. 8604	7. 7176	10. 2015
2. 8249	5. 7170	8. 1257	11. 4819
3. 9781	6. 9410	9. 6729	12. 9197

EXERCISE.

81. 1. One half of 90 cents is how many cents?

2. Divide 9 dimes equally between 2 boys; how many dimes will each receive?

3. Find $\frac{1}{2}$ of 9 tens 8 ones.

$\frac{1}{2}$ of 9 tens is 4 tens, with 1 ten remaining, which is equal to ten ones.   Ten ones and 8 ones are 18 ones. $\frac{1}{2}$ of 18 ones is 9 ones. One-half of 9 tens 8 ones is 49 ones.   (Show by counters.)

4. A man divided $972 equally between his two children; how much money did each receive?

$$2)\text{\$972, money to be divided.}$$
$$\text{\$486, money each child received.}$$

Find ½ of:

5. 9875	7. 9347	9. 3098	11. $8101	13. 7003 bushels.
6. 6001	8. 7190	10. 5729	12. $7900	14. 5045 pecks.

EXERCISE.

82. 1. If a man travels 286 miles in 2 days, at that rate how far will he travel in one day?

2. A clock strikes 312 times in 2 days; how many times does it strike in 1 day?

3. How many times must we take the number 2 to make 652?

4. If a man earns $2 a day, how long will it take him to earn $550?

5. A bookseller paid $114 for photograph albums at $2 each; how many did he buy?

6. A gardener had 750 strawberry plants, and sold ½ of them; how many did he sell?

7. What number multiplied by 2 will produce 1680?

MULTIPLYING AND DIVIDING BY 3.

83. Find the products of:

1. 3086×3	4. 3006×3	7. 3009×3	10. 4123×3
2. 3097×3	5. 3246×3	8. 2549×3	11. 2867×3
3. 2786×3	6. 3269×3	9. 3369×3	12. 3009×3

13. 3 multiplied by 2738 = ?   14. 3 multiplied by 3108 = ?

Find the quotients of:

15. 3687 ÷ 3	17. 7891 ÷ 3	19. 2501 ÷ 3	21. 9108 ÷ 3
16. 3456 ÷ 3	18. 5476 ÷ 3	20. 7057 ÷ 3	22. 8310 ÷ 3

EXERCISE.

84. 1. How many 3-cents are there in 3564 cents?

2. How many yards are there in a coil of wire which contains 2500 feet?

3. What will 687 yards of cloth cost, at $3 a yard?

4. A man saved $3 a week; in how many weeks, at that rate, will he save $450?

5. If a steamer can run 278 miles a day, how far can it run in 3 days?

6. $241 is $\frac{1}{3}$ of my money; how much money have I?

7. Three times $395 is the price of a lot; what is the value of the lot?

8. Find dividends:

3)____	3)____	3)____	3)____
241	335	35⅓	680

9. How is the dividend found, when divisor and quotient are given?   What are the factors of the dividend?

MULTIPLYING AND DIVIDING BY 4, 5, AND 6.

85. Find products of:

1. 856 × 4	3. 968 × 4	5. 2079 × 4	7. 1976 × 4
2. 2798 × 4	4. 989 × 4	6. 2098 × 4	8. 1678 × 4

Find quotients of:

9.	6789 ÷ 4	13.	31033 ÷ 4
10.	2135 ÷ 4	14.	67890 ÷ 4
11.	14009 ÷ 4	15.	34035 ÷ 4
12.	15203 ÷ 4	16.	39393 ÷ 4

86. Find products of:

1. 1856 × 5	3. 2765 × 5	5. 3579 × 5	7. 1948 × 5
2. 2708 × 5	4. 3769 × 5	6. 1978 × 5	8. 1067 × 5

Divide by 5:

9. 19290	12. 18605	15. 46979	18. 47464
10. 94806	13. 43441	16. 37300	19. 89180
11. 31433	14. 38024	17. 54306	20. 34744

87. Multiply by 6:

1. 9874	4. 5907	7. 7308	10. 9396
2. 3009	5. 8679	8. 5897	11. 2958
3. 0068	6. 1948	9. 6087	12. 1769

Divide by 6:

13. 32430	16. 44445	19. 56457	22. 17171
14. 34850	17. 46847	20. 58259	23. 19191
15. 37838	18. 49250	21. 57456	24. 31433

88.   **CLASS EXERCISE.**

NOTE.—Each pupil in turn should multiply or divide one number by 6 and add the number carried over, or give the remainder.

1.   431024516819278
                            6
      ——————————————

2.   843765074957
                      6
      ——————————————

3. 6)468471029872109

4. 6)23453840196

UNITED STATES MONEY.

89. Draw a one-cent piece.　Draw a dime.　How many cents equal a dime?

How many cents make a dollar?

How many tens make one hundred?　How many dimes make a dollar?　One dollar is written, $1.

$$10 \text{ cents } = 1 \text{ dime.}$$
$$10 \text{ dimes} = \$1.$$

Half a dollar is how many cents?　50 is what part of 100? 50 cents is what part of $1?

25 cents is what part of 100 cents?　What part of $1? What part of 50 cents?

$\frac{2}{4}$ of $1 are how many cents?　$\frac{1}{2}$ of $1 is how many cents?

$\frac{1}{2}$ of $1 is how many dimes? $\frac{1}{4}$ of $1 is how many dimes? Half a dime is how many cents?

If I spend $\frac{1}{4}$ of $1, how many fourths of $1 shall I have left?　How many cents?

Find with counters (buttons or circular discs) 100 cents; find 5 more cents　How many cents have you?　How many dollars and cents?

To show that we have one dollar and five cents, we write it in this way: $1.05, placing a period between dollars and cents.

Write one dollar and three cents; one dollar and six cents.

The cents are written at the right of the dollars, with a period between the dollars and cents.　Two places are required to express cents when the dollar sign is used.

90. 1. Begin with $1, and write all the dollars and cents up to $1.25.

2. Write the following in figures:

One dollar fifty cents; one dollar and sixty-nine cents; one dollar one cent; one dollar and ninety-nine cents.

3. Read the following:

$0.06	$1.02	$1.10	$1.70	$0.03
$1.00	$1.09	$1.01	$1.71	$1.44
$1.07	$1.90	$1.75	$1.17	$1.50
$1.88	$1.17	$0.98	$1.27	$1.80
$1.11	$1.60	$1.36	$1.05	$1.08

4. Write the above numbers and add.

Add as in simple numbers and separate dollars from cents by a period.

5. How many cents are there in $2? In $3? In $4?

6. Write the following in figures:

Two dollars seven cents; two dollars twelve cents; three dollars forty cents; four dollars ninety cents; five dollars nine cents; seven dollars seven cents.

7. Read the following:

$6.08	$0.01	$5.05	$6.15	$7.71	$20.05
$9.10	$8.01	$4.01	$6.51	$7.07	$30.50
$7.05	$9.09	$3.10	$0.05	$10.50	$29.16
$4.04	$5.50	$6.11	$7.17	$10.05	$40.12

8. How many cents are there in two dollars ninety-five cents?

9. How many dollars in six hundred fifty cents?

10. How many hundreds in seven hundred ninety?

11. How many 50's in 200?   How many 50-cent pieces in $2?

12. Put down a dollar for each hundred cents in ten dollars.   How many hundred cents make ten dollars?

13. How many cents make seven dollars seven cents?

14. Find the sum of $9.06 and $12.20.

15. Find the sum of $15.25 and $4.30.

16. Subtract:

$12.00 — $5.00. $20.00—$6.00.
$15.50 — $12.50. $9.30—$8.30.

Subtract as in simple numbers, and separate dollars from cents by a period.

ADDITION AND SUBTRACTION BY ENDINGS.

91. Write ten numbers ending in 4; add 2 to each of these numbers.

14	24	34	44	54	64	74	84	94	104
2	2	2	2	2	2	2	2	2	2

With what figure does each sum end?

Make a subtraction table by using the results of addition obtained above and subtracting 2 from each.   Thus:

16	26	36	46	56	66	76	86	96	106
2	2	2	2	2	2	2	2	2	2

With what figure does each remainder end?

Write ten numbers ending in 3, and add 4 to each number.   What is the ending figure?

Write the results of additions obtained above and subtract 4 from each number.   What is the ending figure?

92.   **1 + 8.**

Add, giving first the ending figure of the sum, and then the whole sum:

8	18	28	38	48	58	68	78	88	98
1	1	1	1	1	1	1	1	1	1

1	11	21	31	41	51	61	71	81	91
8	8	8	8	8	8	8	8	8	8

Write the results of addition obtained above and subtract 1 from each number.   Subtract 8 from each.

Add, beginning at the left:

1, 8, 1, 1, 8, 1, 1, 8, 1, 1, 8, 1, 8, 1, 1, 8.
8, 1, 1, 8, 1, 1, 1, 8, 1, 1, 8, 1, 8, 1, 1, 1.
9, 6, 3, 1, 1, 1, 8, 1, 8, 1, 1, 8, 1, 1, 1, 8.
6, 8, 4, 1, 1, 8, 1, 1, 1, 8, 1, 8, 1, 1, 1, 8.

93.   **1 + 9.**

Add 9 to numbers ending in 1:

1	11	21	31	41	51	61	71	81	91
9	9	9	9	9	9	9	9	9	9

Make a subtraction table, taking 9 from each of the results of addition obtained above.

Add, beginning at the left:

1, 9, 9, 1, 1, 9, 1, 9, 1, 9, 1, 9, 1, 9, 1, 9.
9, 1, 1, 9, 9, 1, 1, 9, 9, 1, 1, 9, 1, 9, 9, 1.
8, 8, 4, 1, 9, 1, 9, 8, 1, 1, 9, 1, 9, 1, 9.
9, 8, 3, 9, 1, 1, 9, 1, 9, 9, 1, 1, 9, 5, 1.
8, 7, 5, 9, 1, 8, 1, 1, 9, 1, 1, 9, 1, 9, 9, 1.

Add, beginning at the bottom of the line:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
9	1	1	9	2	9	8	9	8	9	9	1
1	9	1	1	8	1	1	1	1	1	1	9
9	1	8	9	1	9	8	3	9	1	9	1
1	9	1	9	8	1	1	6	1	9	1	1
1	1	8	1	1	1	9	9	1	9	1	5
8	1	1	9	1	1	1	1	9	1	8	4
1	9	9	1	9	8	1	1	9	1	1	1
9	9	1	1	1	1	8	9	1	9	9	9
1	1	1	9	1	9	1	1	1	1	1	1
1	4	1	5	8	7	7	3	1	5	9	7
9	8	9	9	1	4	5	7	3	7	6	6
9	8	9	6	9	9	8	9	5	7	5	6
—	—	—	—	—	—	—	—	—	—	—	—

Copy and add:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
99	99	99	88	98	19	99	89	99	91
91	11	11	11	91	91	99	19	11	19
11	11	11	98	19	11	11	91	99	91
19	88	19	11	91	18	11	11	11	19
99	91	81	99	11	89	19	99	11	11
11	19	90	11	19	10	89	11	91	91
11	11	18	11	89	91	11	11	98	19
81	19	11	31	11	19	15	81	14	16
93	46	99	39	99	94	47	98	68	46
75	95	61	99	71	67	98	79	98	98

94. **2 + 5 and 2 + 6.**

Add 5 and 6 to numbers ending in 2. Read the ending figure first, then the whole sum:

2	12	22	32	42	52	62	72	82	92	102
5	5	5	5	5	5	5	5	5	5	5

2	12	22	32	42	52	62	72	82	92	102
6	6	6	6	6	6	6	6	6	6	6

Make subtraction tables by using the results of addition and subtracting 5 from each. Subtract 6 from each.

Copy and add:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
15	16	16	81	16	22	15	51	69	66
62	11	52	11	12	11	61	21	11	22
21	69	21	16	51	91	21	16	19	11
19	21	11	62	21	16	16	12	11	91
11	11	18	21	16	12	12	61	51	16
81	16	61	11	92	61	81	21	26	12
11	62	21	14	11	21	11	11	12	61
15	25	16	27	11	11	12	14	19	29
65	97	89	57	69	99	68	67	65	97
97	78	83	80	99	78	98	96	86	83

95. **2 + 7.**

Add:

2	12	22	32	42	52	62	72	82	92	102
7	7	7	7	7	7	7	7	7	7	7

Make a table, subtracting 7 from each of the results of addition above.

Add, beginning at the left:

2, 7, 1, 9, 1, 2, 7, 1, 1, 9, 2, 7, 1, 2, 7.
9, 8, 2, 1, 9, 1, 2, 7, 1, 2, 7, 1, 9, 1, 2.
6, 6, 5, 2, 1, 2, 6, 1, 1, 2, 5, 2, 1, 2, 7.

Copy and add:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
97	87	72	11	67	79	11	71	11	19
12	12	21	77	21	21	71	27	79	71
71	11	17	22	17	11	26	12	21	27
27	61	92	11	72	26	12	71	97	92
12	26	11	79	21	52	71	27	12 ·	19
91	12	79	21	19	21	27	12	19	11
12	71	21	11	91	12	12	91	91	91
3	22	11	92	17	74	29	18	14	11
77	98	79	98	77	28	45	77	78	79
97	89	89	78	85	75	96	84	78	89

EXERCISE.

96. Subtract:

(1)	(2)	(3)	(4)	(5)	(6)
4221	5121	7011	3121	6321	4112
132	223	213	232	332	123

 7. $9131 - 322 = ?$ 13. $2121 - 312 = ?$
 8. $4011 - 303 = ?$ 14. $4118 - 223 = ?$
 9. $5210 - 223 = ?$ 15. $5102 - 213 = ?$
10. $3101 - 222 = ?$ 16. $6110 - 123 = ?$
11. $5119 - 223 = ?$ 17. $8112 - 213 = ?$
12. $3122 - 123 = ?$ 18. $7231 - 322 = ?$

Subtract:

	(19)	(20)	(21)	(22)	(23)	(24)
	4310	5301	8234	6202	8402	5021
	234	404	344	334	314	334

25. $5012 - 223 = ?$ 31. $9139 - 244 = ?$ 37. $9301 - 3544 = ?$
26. $4610 - 132 = ?$ 32. $8123 - 334 = ?$ 38. $4302 - 1443 = ?$
27. $7051 - 233 = ?$ 33. $5210 - 334 = ?$ 39. $6201 - 344 = ?$
28. $6311 - 233 = ?$ 34. $9401 - 424 = ?$ 40. $9032 - 334 = ?$
29. $5012 - 213 = ?$ 35. $5204 - 325 = ?$ 41. $6020 - 2344 = ?$
30. $6300 - 1311 = ?$ 36. $9103 - 234 = ?$ 42. $8023 - 3254 = ?$

CLASS EXERCISE.

97. NOTE.—Let each pupil subtract one number.

1. 820431290425613
   624153423542134

2. 76498364271503
   53726547326174

3. 87365419854721
   28158274936294

4. 3746937100
   2587394837

DRY MEASURES.
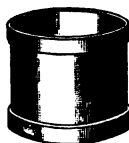
PINT.   QUART.   PECK.

98. 1. A quart of berries is how many pints?
2. A peck of beans is how many quarts?
   Eight quarts make a peck.

3. Where have you seen these measures used? Name some things which you have seen measured by them.

4. Half a peck of nuts is how many quarts?

5. ¼ of a peck is how many quarts?

6. 4 quarts of berries are what part of a peck?

7. 6 quarts are what part of a peck?

8. ¾ of a peck of oats are how many quarts?

9. John sowed ¾ of a peck of blue-grass seed; how many quarts were left out of a peck?

99. *Four pecks make a bushel.*

1. ½ a bushel of potatoes is how many pecks?

2. ¾ of a bushel are how many pecks?

3. Half a bushel of cranberries is how many quarts?

4. Two bushels are how many pecks?

5. Estimate the capacity of a box or basket brought into the schoolroom.

6. 1½ bushels of walnuts are how many pecks?

7. Henry gathered a bushel of beans from his garden, and sold half of them for 25 cents a peck; how much money did he receive?

100. Grains, fruits, vegetables, and some other things that are not liquids, are sold by these measures. They are called *Dry Measures.*

$$
\begin{aligned}
2 \text{ pints (pt.)} &= 1 \text{ quart (qt.)}. \\
8 \text{ quarts} &= 1 \text{ peck (pk.)}. \\
4 \text{ pecks} &= 1 \text{ bushel (bu.)}.
\end{aligned}
$$

MISCELLANEOUS PROBLEMS.

101. 1. How many feet are there in a yard? How many inches in a yard?

2. $\frac{1}{3}$ of a yard is how many inches? How many feet?

3. We have a measure which holds just 8 quarts; what is the measure called? How many quarts are there in a peck of corn?

4. A party of boys went nutting and gathered $2\frac{1}{4}$ pecks of nuts; how many quarts did they have?

5. 32 quarts of strawberries are how many gallons?

6. At 6 cents a yard, how many yards of muslin can you buy for 72 cents?

7. How many spools of thread can I buy for 35 cents, at 5 cents a spool? How many at 4 cents a spool, and how many cents remaining?

8. $\frac{1}{4}$ of 24 acres of land is planted in sugar-corn, $\frac{1}{8}$ in potatoes, $\frac{1}{4}$ in oats, and the remainder in meadow; how many acres are planted in meadow?

9. A man is rowing down the river 8 miles an hour; at that rate, how long will he be in going 48 miles?

10. At 4 cents a pound, how many pounds of oatmeal can you get for 60 cents?

11. 12 bushels are how many pecks?

12. How many quarts are there in 5 pecks?

13. A boy earned $1.65, and his father gave him 35 cents; he paid 50 cents for a scrapbook; how much money had he left?

14. Bought 10 yards of cloth at 4 dollars a yard, and sold it for $8 less than I gave for it; how much did I get for it?

15. A boy earned 75 cents a day, and paid 50 cents a day for his board; how much did he save each day?

16. How much did this boy save in 6 days?

17. Max has a quarter of a dollar, a dime, a 5-cent piece; how much money has he?

18. James has $\frac{1}{4}$ as much money as Max; how much has he?

19. We paid for a Christmas tree, $2; for tapers, 40 cents; for candy, 75 cents; for netting for candy bags, 10 cents; for toys, $1.20; for books, $3.60; what did all cost?

20. How many yards of fringe will be needed to go round a rug 5 ft. long and 3 ft. wide?   (Make a drawing.)

21. A class of children made 69 holly wreaths to trim a schoolroom, and used all but 10; how many did they use?

22. If $\frac{1}{4}$ of a yard of ribbon costs 2 cents, what is the cost of a yard?   How many yards can I buy for 48 cents?

23. A man bought 60 boxes of peaches, but found $\frac{1}{4}$ of them unsound; how many boxes were sound?

24. Mary's aunt gave her a doll for which she paid $4; for the doll's house she bought a set of chairs for which she paid $1.50, a sofa for $1, a bedstead for $1.20, and a little bureau for 90 cents; what did all cost?

25. How many feet must a boy walk in going around this lot?

ADDITION AND SUBTRACTION BY ENDINGS.

102. **2 + 8.**

Make a table, adding 2 to numbers ending in 8.   Add 8 to numbers ending in 2.

Make a table, subtracting 2 from the results of this addition.   Subtract 8 from each of these results.

Copy and add:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
91	98	97	89	86	82	89	78	97	95
17	12	12	28	12	29	18	22	12	12
22	81	78	82	11	81	72	89	89	79
68	27	22	29	87	28	29	21	21	21
22	92	89	91	22	12	91	98	98	80
18	18	21	18	18	19	18	10	12	28
72	82	91	82	72	81	82	82	82	92
24	22	12	26	28	28	26	29	25	16
88	69	88	95	84	45	87	87	89	86
78	99	89	69	88	97	77	74	84	88

Add:

11. 27, 62, 29, 81, 28, 12, 75, 27, 88, and 80.
12. 68, 22, 89, 21, 98, 12, 80, 28, 63, and 99.

103. **2 + 9.**

Add:

2	12	22	32	42	52	62	72	82	92
9	9	9	9	9	9	9	9	9	9

9	19	29	39	49	59	69	79	89	99
2	2	2	2	2	2	2	2	2	2

Make a table, subtracting 9 from each of the results obtained above.   Subtract 2 from each.

Add:

9, 2, 8, 2, 1, 9, 1, 9, 1, 9, 1, 9, 1, 9, 8, 2.
6, 6, 9, 1, 9, 1, 9, 1, 6, 2, 2, 6, 1, 1, 7, 2.
9, 9, 2, 2, 9, 1, 9, 1, 9, 9, 2, 9, 9, 2, 2, 2.
8, 4, 9, 9, 2, 9, 1, 7, 2, 9, 2, 6, 2, 9, 2, 7.

Copy and add:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
89	89	99	89	99	29	89	82	72	89
22	28	81	29	81	69	92	97	21	20
98	12	28	92	28	22	99	21	97	99
92	79	92	99	92	89	19	99	92	92
29	29	99	29	99	29	92	92	29	29
99	92	29	92	29	92	28	29	89	92
92	99	12	91	82	99	92	91	22	91
29	29	22	22	24	29	19	25	94	24
54	68	49	98	67	65	65	97	18	97
97	84	79	59	89	77	86	58	48	57

Add:

11.   29, 79, 22, 98, 92, 29, 99, 92, 28, 99, and 43.
12.   98, 82, 29, 99, 92, 29, 92, 96, 29, 64, and 80.

EXERCISE.

104. Find the differences:

1. 8013 − 334 = ?	15. 8054 − 3505 = ?
2. 7321 − 233 = ?	16. 7033 − 2204 = ?
3. 8122 − 124 = ?	17. 7021 − 3402 = ?
4. 6124 − 334 = ?	18. 9041 − 405 = ?
5. 9324 − 405 = ?	19. 2043 − 535 = ?
6. 8432 − 445 = ?	20. 7040 − 534 = ?
7. 6242 − 2345 = ?	21. 7031 − 435 = ?
8. 6301 − 3444 = ?	22. 6304 − 1325 = ?
9. 6413 − 1434 = ?	23. 5402 − 3444 = ?
10. 8234 − 1135 = ?	24. 5204 − 2245 = ?
11. 8012 − 245 = ?	25. 5302 − 325 = ?
12. 4210 − 245 = ?	26. 9303 − 5454 = ?
13. 6243 − 2345 = ?	27. 9000 − 2001 = ?
14. 8544 − 2035 = ?	28. 9011 − 7017 = ?

OUNCES AND POUNDS.
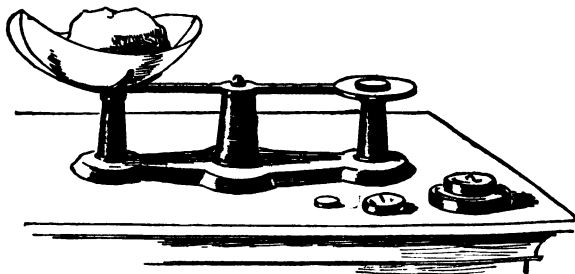
105. 1. If I put the pound weight on one side of the scales, how many ounces must I put on the other side to balance it?   *A pound is 16 ounces.*

2. $\frac{1}{4}$ of a pound is how many ounces?

3. If I wish to buy a quarter of a pound of tea, how many ounces must be put upon the scales to balance it?

4. 4 ounces of ginger are what part of a pound?

5. At 5 cents an ounce, what will $\frac{1}{4}$ of a pound of celery seed cost?

6. At 2 ounces for 5 cents, how many ounces of pepper can be bought for 20 cents?

7. $1\frac{1}{2}$ pounds of figs are how many ounces?

8. $\frac{3}{4}$ of a pound of maple sugar are how many ounces?

16 ounces (oz.) = 1 pound (lb.).

106.   MISCELLANEOUS PROBLEMS.

1. A man paid $72 for a wagon and $8 for repairs, then sold it so as to gain $9; how much did he receive for it?

2. Three men bought a horse, the first man paying $36, the second man $15, and the third man as much as the first two; how much did the horse cost?

3. If I buy 11 yards of velvet at $3 a yard, and sell it at $4 a yard, how much shall I gain?

4. If a man earns $12 a week and spends $7, how much will he save in 6 weeks?

5. Willie gathered a bushel of chestnuts; he gave his brother 10 quarts, kept 6 quarts, and sold the remainder; how many quarts did he sell?

6. When Alfred reads 8 pages more he will have finished his story book, which contains 90 pages; how many pages has he read?

7. A man gave a watch and $10 in money for a horse worth $75; what is the value of the watch?

8. Two persons start from the same point and travel in opposite directions; one travels 26 miles and the other 38 miles; how far apart are they?

9. A man saved 24 dollars one month, half as much the next month, and 6 dollars the third month; how much money had he saved at the end of the three months?

10. If 82 feet of wire are already used in making a fence, and 9 feet more are needed, how much wire will be used?

11. James shoots an arrow which does not reach the mark by 9 feet. If the mark is 51 feet away, how far is the arrow from James? (Make a drawing.)

12. Two persons start from the same place and travel in the same direction; one travels 40 miles an hour, and the other 35 miles an hour; how far apart will they be in 1 hour? (Show by drawing) How far in 6 hours?

13. Charles gets $6 a month for selling a daily paper; Henry gets $\frac{1}{3}$ as much for selling a weekly paper; how much will both have earned in 5 months?

14. From a chest of tea containing 60 pounds, 9 pounds were sold at $1 a pound; what was the value of the remainder, at the same rate?

15. I bought a bushel of tomatoes for 70 cents, a half-bushel of turnips for 20 cents, and a peck of beans for 10 cents; what I paid for all was half the cost of a barrel of potatoes. What did the potatoes cost?

16. A box contains 134 oranges, and a barrel contains 64 more than the box; how many oranges does the barrel contain?

17. I bought a horse and sleigh for $150; the sleigh cost $45; what did the horse cost?

18. After spending $80 for a pony, George found that he

had $65 left in his savings bank; how much money had he
at first?

19. In an orchard there are 150 apple trees; this is 50
more than the number of peach trees; how many peach
trees are there?

20. A man having 190 young orange trees, bought 89
more, and then sold 50; how many had he left?

21. Add three hundred nine to seven hundred eleven,
and subtract twenty-nine from the sum.

22. A farmer bought 40 sheep for 144 dollars at one time,
and 50 sheep for 155 dollars at another time; how much did
the sheep cost him?

23. A boy shot an arrow 145 feet up the road, and another
149 feet down the road; how far were the arrows apart?
(Make a drawing.)

24. What will 150 tons of coal cost, at $6 a ton?

ADDITION AND SUBTRACTION BY ENDINGS.

107. Make a table, adding 3 to numbers ending in 3.
What is the ending figure of each sum?

Add 3 to numbers ending in 4.

Add 3 to numbers ending in 5. What is the ending figure?

Make subtraction tables, taking 3 from the results ob-
tained in each of the three addition tables above.

108.   **3 + 5.**

Add, beginning at the left:

5, 3, 2, 5, 3, 2, 5, 3, 2, 3, 5, 2, 5, 3, 2.
9, 6, 3, 2, 3, 5, 1, 2, 2, 5, 2, 5, 3, 2, 5.
8, 7, 3, 2, 5, 3, 1, 2, 4, 3, 2, 3, 5, 1, 2.

Add, beginning at the bottom of the column:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
95	39	53	23	85	99	29	82	55	59
23	92	39	19	23	92	89	95	22	39
59	15	99	51	99	29	22	23	92	92
31	23	92	32	91	91	12	29	92	92
92	52	29	95	22	12	55	59	23	25
95	35	91	13	95	25	33	32	94	23
23	93	12	21	13	53	12	92	10	59
22	24	25	32	24	38	23	24	24	39
59	68	57	48	58	64	57	56	57	54
99	98	86	79	98	98	78	98	79	98

109.   **3 + 6.**

Add:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
66	36	89	38	52	99	26	69	29	96
33	83	22	99	31	21	63	92	62	29
91	29	66	92	16	66	39	26	36	62
26	92	33	26	63	33	92	63	93	36
63	26	99	13	31	99	23	39	29	93
39	63	29	69	96	22	36	92	32	29
92	32	62	32	23	67	56	99	68	69
26	93	36	96	32	36	27	23	27	36
67	97	55	95	59	67	67	68	67	58
96	88	99	78	79	99	90	89	67	98

110.   **3 + 7.**

Make a table, adding 7 to numbers ending in 3 and 3 to numbers ending in 7.

Make a table, subtracting 7 from the results of the addition tables.   Subtract 3 from the same numbers.

Add:

9, 9, 2, 3, 7, 2, 9, 9, 3, 7, 3, 6, 2, 9, 3, 7.
6, 6, 7, 2, 9, 3, 7, 2, 9, 9, 3, 7, 2, 9, 9, 5.
9, 7, 4, 3, 7, 2, 9, 9, 3, 6, 2, 9, 3, 7, 2, 9.
8, 7, 5, 2, 9, 9, 3, 7, 3, 6, 2, 9, 3, 5, 2, 3.

Add:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
69	99	99	92	99	62	29	96	73	78
32	79	22	26	99	36	90	73	37	32
76	32	56	73	29	73	22	39	93	97
33	96	33	39	82	30	68	19	99	93
77	24	99	99	27	99	32	92	20	29
33	97	29	22	73	9	77	97	9	72
99	73	62	63	30	92	33	23	72	36
9	32	37	38	65	23	92	57	38	95
96	89	74	79	6	98	99	7	65	98
66	69	79	80	99	69	79	96	97	70

REVIEW.

111. Add:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
57	17	28	28	97	16	52	55	86	58
73	42	42	53	32	51	37	42	73	22
32	53	33	36	52	32	31	28	39	29
26	37	35	81	26	97	59	52	11	61
62	51	33	22	92	11	21	31	78	23
23	23	43	35	17	29	27	35	22	37
89	89	98	57	98	76	55	68	21	42
88	97	86	96	85	85	98	86	24	35

EXERCISE.

112. Subtract:

(1)	(2)	(3)	(4)	(5)	(6)
5514	5065	7617	708	8119	8004
1445	5050	3455	3055	5505	4345

7.	8301 − 2034	13.	7322 − 6543
8.	9312 − 3543	14.	6411 − 5524
9.	6431 − 2332	15.	3501 − 3032
10.	8433 − 3544	16.	8032 − 6503
11.	9441 − 5034	17.	9020 − 5003
12.	9400 — 3623	18.	8042 − 5604

Find the differences:

19.	9000 − 1445	28.	8122 − 4435
20.	8000 − 4405	29.	5333 − 1045
21.	3111 − 2445	30.	7303 − 4045
22.	5111 − 2405	31.	4313 − 4144
23.	7011 − 4435	32.	5113 − 4245
24.	9112 − 4345	33.	9313 − 4344
25.	7414 − 4425	34.	8041 − 1445
26.	4444 − 3345	35.	5414 − 1415
27.	9041 − 4445	36.	8434 − 1435

CLASS EXERCISE.

113. NOTE.—Each pupil should subtract one number.

9602410131120561	17954362801756
5254443513453545	7932425360939

MISCELLANEOUS PROBLEMS.

114. 1. James has 9 cents, and John has three times as many less 6; how many has John?

2. One day a man traveled 25 miles by railroad, 34 miles by steamboat, and returned 10 miles; how far was he then from his starting place?

3. I bought 4 yards of silk at $2 a yard, and 2 shawls at $10 each; how much change ought I to receive from 2 twenty-dollar bills?

4. A grocer paid $165 for 30 barrels of flour, and $50 for 20 barrels of potatoes; how much did he pay for both?

5. A boy who had 53 marbles loaned 20, and afterwards borrowed 9 more; how many marbles had he then?

6. A boy paid $20 for a team of goats, $8 for his carriage, and $4 for harness; he sold them so as to lose $4; for how much did he sell them?

7. I bought 3 yards of cloth at $7 a yard, for a coat; the buttons and cord cost $2, and the making of it $10; what was the cost of the coat?

8. A pole is 40 feet long. If $\frac{1}{8}$ of it is in the ground, and the rest in the air, how many feet are in the air?

9. A man gave a carriage and $110 in money for a lot worth $400; what was the value of the carriage?

10. Some children returned from the lake with a basket of shells; after giving half of them away, they had 95 left. How many had they at first?

11. A party of school children went to Fairview Park. $1.75 is 50 cents less than they paid for carfare; how much did they pay?

12. John bought a pack of shingles, and used 175 in

mending the roof. He had 75 left; how many did the pack contain at first?

13. A farmer having $156 paid one-half of his money for a horse, and one-half of the remainder for a cow; how much did each cost?

14. How much money has the farmer left after paying for both horse and cow?

115.   **3 + 8.**

Make a table, adding 8 to numbers ending in 3, and 3 to numbers ending in 8.

Write the results of the addition above and subtract 8 from each. Subtract 3 from each number.

Add:

6, 7, 8, 2, 8, 9, 3, 8, 9, 3, 8, 9, 3, 8, 9.
9, 9, 3, 9, 3, 8, 9, 2, 9, 9, 3, 8, 9, 0, 9.
7, 4, 9, 3, 8, 9, 3, 8, 9, 2, 9, 9, 0, 3, 7.
9, 8, 3, 3, 7, 3, 8, 9, 2, 9, 9, 3, 7, 3, 8.

Add:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
82	30	93	89	88	59	93	7	89	90
39	99	99	32	33	32	99	87	32	23
93	8	89	76	97	99	29	33	9	69
87	83	32	33	83	98	72	79	78	8
39	37	99	7	39	23	37	28	33	33
72	93	98	93	78	97	93	82	97	79
29	99	23	89	33	83	89	32	83	33
8	23	94	38	99	36	38	93	33	99
86	59	89	65	94	57	56	88	58	89
77	99	77	88	67	97	97	88	99	80

Add:

11. 99, 78, 33, 97, 93, 29, 98, 83, 38, 44, and 98.

12. 88, 33, 99, 89, 32, 99, 92, 28, 98, 84, and 69.

13. Find the sum of: 93, 35, 33, 53, 94, 39, 43, 43, 77, and 98.

14. $62+39+89+23+93+35+43+43+87+77=?$

116.   3 + 9.

Add:

3	13	23	33	43	53	63	73	83	93
9	9	9	9	9	9	9	9	9	9

9	19	29	39	49	59	69	79	89	99
3	3	3	3	3	3	3	3	3	3

Make a subtraction table, taking 9 from each of the results of addition above.   Subtract 3 from each number.

Add; beginning at the left:

9, 4, 9, 8, 2, 9, 9, 3, 9, 8, 3, 8, 9, 9, 1.

9, 9, 3, 9, 3, 9, 9, 9, 3, 9, 8, 3, 9, 9, 9.

8, 5, 9, 9, 9, 3, 7, 3, 8, 9, 3, 9, 8, 0, 9.

8, 9, 3, 3, 7, 3, 8, 9, 3, 9, 7, 2, 9, 9, 2.

$51+9=?$	$62+7=?$	$72-3=?$	$70-2=?$
$72+6=?$	$73+7=?$	$91-2=?$	$90-1=?$
$81+8=?$	$92+8=?$	$81-3=?$	$80-3=?$
$83+9=?$	$93+5=?$	$32-3=?$	$91-3=?$

Add:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
99	99	89	99	89	99	90	8	88	97
93	38	39	39	93	99	39	39	93	99
30	93	93	79	39	39	99	83	99	33
78	77	99	33	98	93	93	99	39	99
99	30	98	99	93	89	29	39	99	89
33	89	33	98	97	38	99	92	83	32
9	93	9	93	33	93	82	89	37	86
99	8	83	37	93	24	37	35	6	90
96	33	99	54	98	67	55	86	57	6
66	59	69	89	69	69	98	60	90	78

Add:

11. 98, 89, 33, 79, 39, 80, 9, 92, 38, 98, and 54.

12. 99, 20, 83, 97, 33, 99, 8, 83, 34, 78, and 78.

13. Find the sum of: 3, 35, 39, 53, 94, 34, 49, 43, 89, and 79.

14. $95 + 39 + 33 + 45 + 83 + 39 + 63 + 34 + 97 + 67 = ?$

EXERCISE.

117. Find the differences·

1. $9453 - 545 = ?$

2. $8453 - 544 = ?$

3. $9341 - 5445 = ?$

4. $8341 - 5345 = ?$

5. $9623 - 3545 = ?$

6. $7344 - 3545 = ?$

7. $6412 - 4534 = ?$

8. $3323 - 2554 = ?$

9. $9203 - 3405 = ?$

10. $8801 - 134 = ?$

11. $7640 - 2534 = ?$

12. $3141 - 2445 = ?$

13. $3001 - 2154 = ?$

14. $6011 - 5403 = ?$

15. 3043 − 1415 = ?
16. 8001 — 5045 = ?
17. 7002 − 5435 = ?
18. 4003 − 3004 = ?
19. 6301 − 4345 = ?
20. 7304 − 3025 = ?
21. 9801 − 534 = ?
22. 8074 − 2135 = ?

23. 7004 − 1345 = ?
24. 9043 − 1534 = ?
25. 3842 − 1435 = ?
26. 5101 − 4434 = ?
27. 8600 − 5534 = ?
28. 8122 − 6035 = ?
29. 5043 − 1415 = ?
30. 4312 − 243 = ?

118. Find the differences:

1. 26345 − 2556 = ?
2. 15043 − 1546 = ?
3. 19411 − 1506 = ?
4. 27522 − 3615 = ?
5. 35432 − 4546 = ?
6. 43543 − 1456 = ?
7. 23543 − 1554 = ?
8. 50354 − 5646 = ?
9. 47352 − 4353 = ?

10. 59203 − 2505 = ?
11. 68304 − 1056 = ?
12. 70005 − 6056 = ?
13. 20003 − 2455 = ?
14. 49503 − 4546 = ?
15. 30533 −   36 = ?
16. 30334 − 3455 = ?
17. 23451 −   56 = ?
18. 10052 − 1554 = ?

COMPARISON OF HALVES, FOURTHS, AND EIGHTHS.
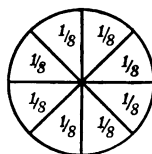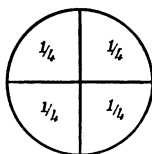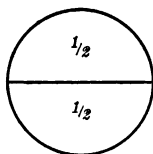
119. 1. A whole melon can be divided into how many halves? How many fourths?

2. Fold a paper square into two equal triangles. One of the triangles is what part of the whole square?
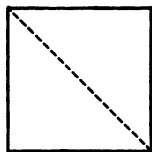
3. Fold the same square so as to make four equal triangles. What part of the whole square is one of the small triangles?

4. $\frac{1}{2}$ is equal to how many fourths?

5. $\frac{1}{2}$ and $\frac{1}{4}$ make how any fourths?

6. $\frac{1}{2}$ and $\frac{2}{4}$ equal how many fourths?

7. Fold your square so as to make eight equal triangles. One of the triangles is what part of the whole square? Two of the triangles are what part of the whole?

8. If three of the triangles were cut out of the square, what part of the whole would be left?

9. $\frac{1}{4}$ of the square is equal to how many eighths? $\frac{1}{2}$ is equal to how many? $\frac{3}{4}$ are equal to how many eighths?

10. $\frac{3}{4}$ of a whole cheese are equal to how many eighths of the cheese?

11. $\frac{1}{4} + \frac{1}{8}$ are how many eighths? $\frac{1}{4} + \frac{3}{8} = ?$

12. $\frac{1}{2} + \frac{3}{8}$ are how many eighths?

NOTE.—Use objects freely in the work with fractions.

120. 1. From your folded squares find the answers to the following questions:

$\frac{1}{2} + \frac{2}{8} = ?$	$\frac{8}{8} - \frac{1}{8} = ?$	$\frac{1}{4} - \frac{1}{8} = ?$	$\frac{1}{2} - \frac{1}{4} = ?$
$\frac{5}{8} + \frac{1}{4} = ?$	$\frac{7}{8} - \frac{3}{8} = ?$	$\frac{3}{4} - \frac{1}{8} = ?$	$\frac{1}{2} - \frac{2}{8} = ?$
$\frac{1}{4} + \frac{3}{8} = ?$	$\frac{3}{4} - \frac{1}{4} = ?$	$\frac{1}{4} - \frac{2}{8} = ?$	$\frac{1}{2} - \frac{3}{8} = ?$

2. Draw a square and divide it into eight equal oblongs; find from the drawing the answers to the following questions:

2 times $\frac{1}{4}=?$ $\frac{2}{4}\times 3=?$ $\frac{1}{4}\times 4=?$

$\frac{2}{4}\times 5=$ how many wholes?

2 times $\frac{2}{4}=?$ $\frac{3}{8}\times 2=?$ $\frac{4}{8}\times 3=?$

$\frac{4}{8}\times 3=$ how many wholes?

2 times $\frac{3}{8}=?$ $\frac{4}{8}\times 2=?$ $\frac{5}{8}\times 2=?$

$\frac{6}{8}\times 2=$ how many wholes?

$\frac{1}{8}\times 4=?$ $\frac{1}{4}\times 3=?$ $\frac{1}{4}$ of $\frac{1}{2}=?$

$\frac{3}{8}\times 4=?$ $\frac{1}{2}$ of $\frac{1}{2}=?$ $\frac{3}{8}\times 2=?$

$\frac{1}{2}\times 2=?$ $\frac{1}{2}$ of $\frac{1}{4}=?$ $\frac{1}{2}\times 4=?$

3. Mary made a cake for tea; half of it was eaten, and the remainder was divided equally among four visitors. What part of the whole cake did each visitor receive?

4. George had a ball of twine for his kite; he used half of it, and divided the remainder equally between two other boys. What part of the whole ball of twine did each boy get?

121. Take two equal squares of paper. Fold each into four equal smaller squares; call them square crackers, and give them to four children, so that they shall have equal shares.

Note.—Distribute all the parts of one square first.

1. What part of the two large squares does each child receive?

2. What part of one square?

3. To how many children did you give the two squares?

4. One of the four equal parts of anything is called what?

Place the small squares together again so as to form the two large squares.

5. $\frac{1}{4}$ of 2 squares is what part of one of the squares?

6. $\frac{1}{4}$ of 2 pies = ? $\frac{1}{4}$ of 2 apples = ? $\frac{1}{4}$ of 2 melons = ?

7. Divide two sticks of candy equally among four boys. What part of the whole will each boy receive?   What part of one stick is that?

122. Take three equal squares of paper.   Divide these equally among four children.   (Fold each into four smaller squares.)

1. What part of the three large squares does each child receive?

2. What part of one square?

3. Into how many equal parts did you divide the three squares?

4. One of these equal parts is called what?

Place the small squares together again so as to form the three large squares you had at first.

5. $\frac{1}{4}$ of 3 squares is what part of one square?

6. What part of one whole toothpick is $\frac{1}{4}$ of 3 toothpicks?

7. Divide 3 oranges equally among 4 boys.   What part of the 3 will each receive? $\frac{1}{4}$ of 3 is what part of 1?

8. Suppose you plant 3 potatoes in 4 hills.   If you divide them equally, what part of 1 potato will be in each hill? (Make a picture to show this.)

9. Give 3 bananas to 4 girls, dividing them equally; what will each girl receive?

10. If you divide 23 melons equally among 4 boys, what is each boy's share?   (Picture.)

11. I wish to put 27 quarts of blackberries into 4 jars, putting the same number of quarts into each; how many quarts will each jar contain?

MULTIPLICATION AND DIVISION.

123. Copy and learn:

$7 \times 7 = 49$	$10 \times 7 = 70$	$8 \times 8 = 64$	$11 \times 8 = 88$
$8 \times 7 = 56$	$11 \times 7 = 77$	$9 \times 8 = 72$	$12 \times 8 = 96$
$9 \times 7 = 63$	$12 \times 7 = 84$	$10 \times 8 = 80$	$8 \times 11 = 88$
$7 \times 8 = 56$	$7 \times 10 = 70$	$8 \times 9 = 72$	$7 \times 12 = 84$
$7 \times 9 = 63$	$7 \times 11 = 77$	$8 \times 10 = 80$	$8 \times 12 = 96$

Recite the division table from the multiplication table.

MENTAL EXERCISE.

124. 1. How many desks are there in a schoolroom which has 7 rows of desks, and 7 desks in each row?

2. If a pair of curtains cost 7 dollars, what will 9 pairs cost?

3. Eight boys are building a snow fort; if each makes 7 balls of snow, how many balls will they have in all?

4. What is the cost of 8 yards of muslin at 8 cents a yard?

5. One peck is how many quarts? John gathered 9 pecks of chestnuts; how many quarts had he?

6. If 8 loaves of bread are used in one week, how long will 96 loaves last?

7. If melons are selling at 8 cents each, what will 9 cost?

8. May had 75 cents to spend for lace at 8 cents a yard; how many yards did she buy? How many cents had she left?

9. At 8 dollars a ton, how many tons of coal can be bought for 96 dollars?

10. At 7 cents a roll, how many rolls of wall paper can be bought for 56 cents?

11. Make problems for:

$10 \times 8 = 80$	$12 \times 7 = 84$	$88 \div 8 = 11$	$56 \div 7 = 8$
$11 \times 7 = 77$	$12 \times 8 = 96$	$70 \div 7 = 10$	$63 \div 7 = 9$

NOTE.—Do this in class.

Finding One of the Equal Parts of a Number.

EXERCISE.

125. 1. If 9 melons cost 72 cents, what is the cost of one?

2. One man working alone can do a piece of work in 56 hours; in how many hours can 7 men do the work?

3. If 8 tons of coal cost 72 dollars, what is the cost of a ton?

4. I paid 96 cents for 8 dozen eggs; how much were they a dozen?

5. If one man works alone, it will take 63 hours to decorate a hall; if 9 men work together, in how many hours can the work be done?

6. A merchant paid 84 dollars for 12 rugs; at that rate, what was paid for one rug?

7. Mary paid 96 cents for 12 dozen buttons; how much were they a dozen?

8. 64 trees were planted in 8 equal rows; how many were planted in one row?

9. How many pecks are there in 72 quarts?

10. A man earned 84 dollars in 7 weeks; at that rate, how many dollars did he earn in one week?

11. How many cents are there in half a dollar?   In $\frac{1}{4}$ of a dollar?   In $\frac{1}{10}$? $\frac{1}{5}$?

12. 25 cents is what part of $1?   20 cents is what part of $1?

13. $\frac{3}{4}$ of $1 are how many cents? $\frac{2}{5}$ of $1? $\frac{3}{5}$ of $1? $\frac{4}{5}$?

14. Frank spent $\frac{1}{10}$ of a dollar for pencils and $\frac{1}{4}$ of a dollar for drawing paper; how much money did he spend?

15. Helen spent $\frac{3}{5}$ of $1 for muslin, and $\frac{1}{5}$ of $1 for thread; how many cents did she spend?

16. Make problems for:

$\frac{1}{7}$ of 49 = 7	$\frac{1}{8}$ of 96 = 12	8)64 bushels	12)96 dollars
		8 bushels	8 dollars
$\frac{1}{8}$ of 72 = 9	$\frac{1}{7}$ of 70 = 10	7)56 cents	10)80 nails
		8 cents	8 nails

NOTE.—Do this in class.

17. Begin with 49 and find one-seventh of all numbers to 63.

Thus: $\frac{1}{7}$ of 49 = 7. $\frac{1}{7}$ of 50 = 7 and 1 remaining. $\frac{1}{7}$ of 51 = 7 and 2 remaining, etc.

18. Find one-eighth of all numbers from 64 to 88.

126.   TABLES FOR REVIEW.

1×6= 6	1×7= 7	1×8= 8
2×6=12	2×7=14	2×8=16
3×6=18	3×7=21	3×8=24
4×6=24	4×7=28	4×8=32
5×6=30	5×7=35	5×8=40
6×6=36	6×7=42	6×8=48

$7 \times 6 = 42$	$7 \times 7 = 49$	$7 \times 8 = 56$
$8 \times 6 = 48$	$8 \times 7 = 56$	$8 \times 8 = 64$
$9 \times 6 = 54$	$9 \times 7 = 63$	$9 \times 8 = 72$
$10 \times 6 = 60$	$10 \times 7 = 70$	$10 \times 8 = 80$
$11 \times 6 = 66$	$11 \times 7 = 77$	$11 \times 8 = 88$
$12 \times 6 = 72$	$12 \times 7 = 84$	$12 \times 8 = 96$

Without rewriting, read these with 6, 7, and 8 first.

MULTIPLYING AND DIVIDING BY 7 AND 8.

127. Multiply by 7:

1. 6948	3. 9485	5. 6098	7. 10769
2. 5769	4. 7906	6. 6937	8. 11894

Divide by 7:

9. 19539	12. 39648	15. 54957	18. 17799
10. 18049	13. 18563	16. 13607	19. 68009
11. 17825	14. 28359	17. 27620	20. 67265

128. Multiply by 8:

1. 3849	3. 6957	5. 6384	7. 6094	9. 8649
2. 8539	4. 9384	6. 3947	8. 7483	10. 5973

Divide by 8:

11. 41443	13. 56457	15. 21391	17. 29019	19. 62808
12. 51652	14. 58259	16. 39036	18. 78863	20. 39013

CLASS EXERCISE.

129. Note.—Let each pupil multiply one number by **7** and add the number carried over.

     1.   42952091897634017926
                             7

     2.   53104293697012369876
                             8

     3.   7)19539021650103121798

     4.   8)51652019098723651904

MISCELLANEOUS PROBLEMS.

130. 1. If in half a day a man picks 4 bushels of apples, and a boy 2 bushels, how many bushels will both pick in a day? In 5 days?

2. A newsboy having 42 papers, sold all but ⅙ of them; how many did he sell? How many had he left?

3. Henry's age, which is 7 years, is 1 seventh of his father's age; how old is his father?

4. What measure holds 4 pecks? 48 pecks of cranberries are how many bushels?

5. A boy having 45 cents spent ⅓ of his money for drawing paper and ⅕ for pencils; how many cents did he spend?

6. How many wheels have six freight cars, if each car has 8 wheels?

7. A farmer's boy fed to his colt ½ a peck of oats each day for eight days; how many bushels is that?

8. John had 5 dimes; he spent 15 cents for stamps, and with the remainder took 7 car rides; what was each fare?

9. I bought a steak weighing a pound and a half; how many ounces did it weigh?

10. 3 pounds of coffee make how many ounces?

11. A bushel of wheat weighs 60 pounds; how many pounds does a peck weigh?

12. Wheat bran weighs 20 pounds to the bushel; what is the weight of a peck?

13. Does a pound of wheat weigh more than a pound of bran? Which is the larger bulk? (See problems 11 and 12.)

14. At 6 cents a pound, how many pounds of rice can you buy for 50 cents?

15. If John gives 3 pecks of corn to twelve horses dividing it equally, how much corn does each horse receive?

16. How many hours are there in 2½ days?

17. If a boy is 3 minutes late at school, how many seconds has he lost?

18. For our school gardens we spent $1.50 for foliage plants, $2.10 for geraniums, $1 for tulip bulbs, and $2 for roses and pansies. How much money had we left out of $10, after paying for all?

19. A farmer raises 850 bu. of corn, 920 bu. of oats, 560 bu. of wheat, 390 bu. of barley, 78 bu. of buckwheat; how much grain has he in all?

20. I had in bank $1125, and drew out $415; how much have I left in bank?

21. Johnson & Co., after selling 2000 cans of sugar corn, had 1500 cans left; how many cans were on sale at first?

22. If I have $230, how much must I add to it to be able to buy a horse and buggy worth $550?

23. A man receives $700 for his fruit crop this year, which is $150 more than he received last year; how much did he receive last year?

24. Add 300 to 500, and from this sum subtract the difference of the numbers.

25. If I borrow at one time $327, and at another time $783, how much do I owe after paying $221?

26. The greater of two numbers is 419, and the less 244; what is their difference?

27. Henry's father was born in 1859; how old is he now?

28. The sum of two numbers is 650; one of the numbers is 200; what is the other?

131.   REVIEW OF ADDITION.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
93	62	22	99	96	69	93	33
35	39	49	29	33	29	33	33
33	89	39	63	39	32	34	45
53	23	28	35	52	56	53	99
94	93	33	93	96	93	92	23
39	35	39	39	33	39	35	64
43	43	32	42	49	43	49	34
43	43	93	43	43	43	43	93
77	87	87	88	89	87	99	98
98	77	79	78	79	78	69	79

(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
89	29	93	26	97	32	23	23
79	63	94	33	29	96	64	56
38	34	34	68	63	23	94	39
93	84	68	89	35	39	29	23
37	28	22	21	93	63	63	65
43	92	99	99	29	25	35	23
43	89	83	83	62	43	93	83
93	33	33	33	33	43	38	23
98	79	87	89	88	99	76	87
76	79	78	76	78	68	66	87

(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
73	62	36	98	29	82	98	96
26	26	68	32	39	99	99	99
29	53	92	39	62	39	39	33
63	37	39	58	72	42	42	65
95	93	43	93	34	49	49	23
23	39	45	39	94	99	78	89
62	42	83	42	89	83	33	22
34	41	28	43	33	33	93	93
95	89	98	77	97	79	88	97
79	79	64	79	79	76	79	79

(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)
29	99	95	72	93	39	98	78	65	99
69	12	29	36	28	63	93	29	99	39
22	37	29	72	53	34	33	79	98	83
99	52	52	29	45	85	25	92	33	85
21	22	33	52	33	39	43	38	72	34
33	93	42	46	66	29	32	49	23	35
79	99	97	97	86	98	89	99	97	99

(35)	(36)	(37)	(38)	(39)	(40)	(41)
87	83	9	936	924	989	484
938	983	692	983	756	933	724
383	315	593	979	364	346	496
˙517	399	836	399	725	953	442
993	622	363	633	492	342	273
332	934	743	494	434	373	944
999	789	998	699	997	798	799
658	66	878	877	278	367	936

M'SCELLANEOUS PROBLEMS.

132. 1. I bought for Christmas presents a calendar, for which I paid $1, a bronze inkstand for $1.50, a paper weight for 90 cents, and an album for $2.50; what did I pay for all?

2. I received $148 for fruit trees, and $260 for shade trees; the expense of raising the fruit trees was $40, and the shade trees $50; what were the profits on each?

3. Bought a house, lot, horse, and buggy for $1400. If I paid $600 for the lot, and $200 for the horse and buggy, how much was paid for the house?

4. An agent during the year traveled 921 miles by railroad and 234 miles by boat; how much farther did he travel by railroad than by boat?

5. A man had $5424. To his son he gave $965, and the remainder to his wife; what was his wife's share?

6. A father and his two sons earned $1843 in a year, the elder son earning $628, and the younger $456; how much did the father earn?

7. What year will it be, in 10 years from this time? In 20 years? In 150 years?

8. A merchant drew out of bank $650 one day, $327 the second, $474 the third, and then had $564 in bank; how much money had he in bank at first?

9. A man bought 23 barrels of flour for $138, 27 barrels for $135, and 36 barrels for $144; how many barrels did he buy, and how many dollars did he pay?

10. A merchant living 18 miles out of Chicago, goes to the city every morning and returns in the evening; how many miles does he travel in 6 days?

11. A shoe merchant sold four dozen pairs of shoes for $192; this is $24 more than they cost him; what did they cost?

12. Holt & Co. sold 620 pairs of gloves this month, which is 20 pairs less than they sold last month; how many pairs were sold last month?

13. A real estate agent sold 6 lots of land for $9,600; if the lots were of equal value, how much did he receive for each ?

ADDITION AND SUBTRACTION BY ENDINGS.

133.   **4 + 4.**

Add:

4	14	24	34	44	54	64	74	84	94
4	4	4	4	4	4	4	4	4	4

Make a subtraction table by using the results of the above addition and subtracting 4 from each.

(1)	(2)	(3)	(4)	(5)	(6)
212	444	929	424	394	793
444	943	393	492	834	339
422	222	994	333	919	449
244	779	933	629	343	333
444	322	243	333	424	934
422	988	928	837	233	382
244	232	933	292	392	893
444	424	397	486	398	329
243	787	683	766	629	829
937	347	677	226	552	458

134.   **4 + 5.**

Add:

14	24	34	44	54	64	74	84	94	104
5	5	5	5	5	5	5	5	5	5

Make a subtraction table by using the results of the above addition and subtracting 5 from each.

(1)	(2)	(3)	(4)	(5)	(6)
425	9	2	54	219	494
554	54	594	294	442	535
141	745	224	591	234	240
514	293	451	435	335	445
445	492	234	954	498	493
151	335	334	839	513	132
415	632	243	332	354	989
552	933	328	535	735	219
326	379	289	232	221	853
396	618	902	893	449	508

135. 4 + 6.

Add:

4	14	24	34	44	54	64	76	84	94	104
6	6	6	6	6	6	6	6	6	6	6

Make a subtraction table, taking 6 from each of the results of the above addition.

(1)	(2)	(3)	(4)	(5)	(6)
389	644	246	454	695	946
983	655	564	645	244	354
439	262	441	242	363	241
690	344	454	464	448	664
834	465	635	345	452	395
376	544	384	369	224	26
946	996	726	892	994	994
562	326	549	839	539	618
55	897	73	686	73	43
7	557	28	154	58	9

MULTIPLICATION AND DIVISION.

136. Copy and learn:

$9 \times 9 = 81$ $10 \times 10 = 100$ $11 \times 11 = 121$
$10 \times 9 = 90$ $11 \times 10 = 110$ $12 \times 11 = 132$
$11 \times 9 = 99$ $12 \times 10 = 120$ $12 \times 12 = 144$
$12 \times 9 = 108$

Write these with the 9, 10, and 11 first.
Recite the division table from the multiplication table.

137.   MENTAL EXERCISE.

1. At 9 cents a pound, what will 12 pounds of raisins cost?

2. A newsboy makes 10 cents a day by selling papers; how much will he earn in 11 days?

3. If 12 grape-fruits cost 144 cents, how much are they apiece?

4. When eggs are selling at 9 cents a dozen, what will 9 dozen cost?

5. A jeweler received in one week $132 for clocks which were valued at $11 each; how many clocks did he sell?

6. A street-car makes a trip of 11 miles in one hour; at that rate, how many miles will it run in 12 hours?

7. 12 men working together can do a piece of work in 9 days; in how many days can one man working alone do the same work?

8. How long will it take an excursion party to complete a journey of 121 miles, walking 11 miles a day?

9. 12 dozen foliage plants were used in the border of a garden walk; how many plants were used?

10. At 10 cents a yard, how many yards of muslin can be bought for $1.20?

11. At 12 cents a pound, what will 9 pounds of maple sugar cost?

12. Make problems for:

$10 \times 10 = 100$	$11)\overline{\$121}$	12 bushels)$\overline{132 \text{ bushels}}$
	11	10

$11 \times 9 = 99$	11 miles)$\overline{110 \text{ miles}}$	12 trees)$\overline{108 \text{ trees}}$
	10	9

NOTE.—Do this in class.

13. Divide all numbers from 9 to 36 by 9, naming each undivided remainder.

14. Divide all numbers from 11 to 44 by 11.

15. Divide all numbers from 12 to 60 by 12.

16. 641009187695398205965897083
$$\underline{\hspace{6cm} 8}$$

17. 541798160708943009685479187
$$\underline{\hspace{6cm} 9}$$

EXERCISE.

138. 1. A gardener sold 10 geraniums for $1 ; what was the value of each plant?

2. Robert spent $\frac{3}{5}$ of $1 for a book; how many cents did he spend?

3. I paid $1 for 3 pounds of coffee; how much was it a pound?

4. If 4 pounds of sugar cost 25 cents, what is the cost of one pound?

5. George had 90 cents and spent $\frac{3}{10}$ of his money for nails; how many cents did he spend?

6. 12 miles is $\frac{1}{10}$ of my journey; what is the whole distance?

7. 132 pounds of prunes were packed in 11 boxes of equal size; how many pounds were put into each box?

8. I paid 12 dollars, which was $\frac{1}{9}$ of my money, for some peach trees; how much money had I?

9. Carl says, " If my marbles were divided equally

among 12 boys, each boy would receive 11 marbles."
How many marbles has he?

10. One man working alone can do a piece of work in 132 days; in how many days can 12 men do the same work?

11. A watch costs $90, and a chain $\frac{1}{9}$ as much; what is the value of the chain? Of both watch and chain?

12. A farmer sells 144 bushels of potatoes to 12 customers; if they are divided equally, how many bushels does each receive?

13. Make problems for:

9)90 pounds	9)108 miles	$\frac{1}{10}$ of $120 = $12.
10 pounds	12 miles	

11)99 cents	11)132 dollars	$\frac{1}{11}$ of 110 miles = 10 miles.
9 cents	12 dollars	

12)84 cents	12)144 inches	$\frac{1}{12}$ of $108 = $9.
7 cents	12 inches	

NOTE.—Do this in class.

CLASS EXERCISE.

139. 1. 6)29855217448115692558121854109792352

2. 6)41909373891581097635338589870093874

3. 7)552347009266560731585872310216<u>3</u>

4. 7)43354746749548787696920132013<u>4</u>

140. MULTIPLICATION TABLE.

$1\times2=2$	$1\times3=3$	$1\times4=4$
$2\times2=4$	$2\times3=6$	$2\times4=8$
$3\times2=6$	$3\times3=9$	$3\times4=12$
$4\times2=8$	$4\times3=12$	$4\times4=16$
$5\times2=10$	$5\times3=15$	$5\times4=20$
$6\times2=12$	$6\times3=18$	$6\times4=24$
$7\times2=14$	$7\times3=21$	$7\times4=28$
$8\times2=16$	$8\times3=24$	$8\times4=32$
$9\times2=18$	$9\times3=27$	$9\times4=36$
$10\times2=20$	$10\times3=30$	$10\times4=40$
$11\times2=22$	$11\times3=33$	$11\times4=44$
$12\times2=24$	$12\times3=36$	$12\times4=48$

$1\times5=5$	$1\times6=6$	$1\times7=7$
$2\times5=10$	$2\times6=12$	$2\times7=14$
$3\times5=15$	$3\times6=18$	$3\times7=21$
$4\times5=20$	$4\times6=24$	$4\times7=28$
$5\times5=25$	$5\times6=30$	$5\times7=35$
$6\times5=30$	$6\times6=36$	$6\times7=42$
$7\times5=35$	$7\times6=42$	$7\times7=49$
$8\times5=40$	$8\times6=48$	$8\times7=56$
$9\times5=45$	$9\times6=54$	$9\times7=63$
$10\times5=50$	$10\times6=60$	$10\times7=70$
$11\times5=55$	$11\times6=66$	$11\times7=77$
$12\times5=60$	$12\times6=72$	$12\times7=84$

$1 \times 8 = 8$	$1 \times 9 = 9$	$1 \times 10 = 10$
$2 \times 8 = 16$	$2 \times 9 = 18$	$2 \times 10 = 20$
$3 \times 8 = 24$	$3 \times 9 = 27$	$3 \times 10 = 30$
$4 \times 8 = 32$	$4 \times 9 = 36$	$4 \times 10 = 40$
$5 \times 8 = 40$	$5 \times 9 = 45$	$5 \times 10 = 50$
$6 \times 8 = 48$	$6 \times 9 = 54$	$6 \times 10 = 60$
$7 \times 8 = 56$	$7 \times 9 = 63$	$7 \times 10 = 70$
$8 \times 8 = 64$	$8 \times 9 = 72$	$8 \times 10 = 80$
$9 \times 8 = 72$	$9 \times 9 = 81$	$9 \times 10 = 90$
$10 \times 8 = 80$	$10 \times 9 = 90$	$10 \times 10 = 100$
$11 \times 8 = 88$	$11 \times 9 = 99$	$11 \times 10 = 110$
$12 \times 8 = 96$	$12 \times 9 = 108$	$12 \times 10 = 120$

$1 \times 11 = 11$	$1 \times 12 = 12$
$2 \times 11 = 22$	$2 \times 12 = 24$
$3 \times 11 = 33$	$3 \times 12 = 36$
$4 \times 11 = 44$	$4 \times 12 = 48$
$5 \times 11 = 55$	$5 \times 12 = 60$
$6 \times 11 = 66$	$6 \times 12 = 72$
$7 \times 11 = 77$	$7 \times 12 = 84$
$8 \times 11 = 88$	$8 \times 12 = 96$
$9 \times 11 = 99$	$9 \times 12 = 108$
$10 \times 11 = 110$	$10 \times 12 = 120$
$11 \times 11 = 121$	$11 \times 12 = 132$
$12 \times 11 = 132$	$12 \times 12 = 144$

Be sure to read these tables both ways.

CHAPTER V.

READING AND WRITING NUMBERS.

Two Periods: Units and Thousands.

2d period.   1st period.
Thousands.   Units (ones).

hundreds.	tens.	units.	hundreds.	tens.	units.
0	0	0	0	0	0

141. Ten *ten-thousands* are equal to one *hundred-thousand*.

One hundred-thousand is how many times ten thousand?

Hundred-thousands are written in the first place to the left of ten-thousands.

405,623 is read, " four hundred five thousand six hundred twenty-three." The figure 4 expresses the number of hundred-thousands.

In the number 405,623, in what place, or *order*, does the figure 6 stand? The figure 4? 2? 0?

Ten units of any order make *one* of the next higher order.

Expressing numbers by means of figures is called **Notation.** Expressing numbers in words is called **Numeration.**

142. Write 6 ciphers and separate them into periods. Place 3 in hundred-thousands' place, 2 in thousands' place, and 4 in hundreds' place. Read the number you have written.

Read the following numbers:

401,392	500,020	800,005	110,111
503,001	909,008	850,050	101,001
648,406	763,204	616,016	111,101

Express the following in figures:

Two hundred thousand sixty-three.

Seven hundred seven thousand eighty-one.

Five hundred fifty-one thousand one.

Eight hundred eighteen thousand six.

One hundred eleven thousand eleven.

Two hundred thousand twelve.

Nine hundred ninteen thousand nineteen.

Three Periods: Units, Thousands, and Millions.

8d period. Millions.			2d period. Thousands.			1st period. Units.		
hundreds.	tens.	units.	hundreds.	tens.	units.	hundreds.	tens.	units.
0	0	0	0	0	0	0	0	0

143. The third period of figures expresses *ones* of millions, *tens* of millions, and *hundreds* of millions.

Write 9 ciphers and separate them into periods. Place 3 in ten-thousands' place, 6 in ten-millions' place, 8 in tens' place, 4 in thousands' place, and 7 in millions' place. Read the number.

Read the following numbers:

100,000,000	150,004,150	19,300,019
1,000,000	50,040,040	9,999,000
4,700,630	804,307,321	11,110,011
20,343,101	10,010,001	10,111,101

Write in figures:

Fifty-six million one hundred seventeen thousand six hundred nine.

Three hundred eight thousand three hundred eight; six million sixteen.

Ten million one hundred eleven thousand one.

MULTIPLYING AND DIVIDING BY 9, 10, 11, AND 12.

144. Multiply by 9:

1. 8439	6. 5968	11. 6874	16. 9005	21. 6298
2. 7095	7. 6374	12. 3758	17. 8161	22. 2759
3. 6394	8. 4738	13. 8647	18. 7463	23. 8463
4. 8007	9. 6834	14. 9376	19. 6389	24. 3874
5. 6398	10. 4958	15. 4837	20. 8476	25. 6438

145.   CLASS EXERCISE.

$9 \div 9 = 0$	$17 \div 9 = 1$, 8 rem.	$25 \div 9 = 2$, 7 rem.
$10 \div 9 = 1$, 1 rem.	$18 \div 9 = 2$	$26 \div 9 = 2$, 8 rem.
$11 \div 9 = 1$, 2 rem.	$19 \div 9 = 2$, 1 rem.	$27 \div 9 = 3$
$12 \div 9 = 1$, 3 rem.	$20 \div 9 = 2$, 2 rem.	$28 \div 9 = 3$, 1 rem.
$13 \div 9 = 1$, 2 rem.	$21 \div 9 = 2$, 3 rem.	$29 \div 9 = 3$, 2 rem.
$14 \div 9 = 1$, 5 rem.	$22 \div 9 = 2$, 4 rem.	$30 \div 9 = 3$, 3 rem.
$15 \div 9 = 1$, 6 rem.	$23 \div 9 = 2$, 5 rem.	$31 \div 9 = 3$, 4 rem.
$16 \div 9 = 1$, 7 rem.	$24 + 9 = 2$, 6 rem.	$32 \div 9 = 3$, 5 rem.

Beginning with 33, complete the table to $108 \div 9$, each pupil giving one number divided by 9.

NOTE.—Do this in class.

Divide:

       8)39806956597477590077495805479723136

       8)7767000543372858384567121413212

       9)44782826172173538837182781164688528

       9)17343806471078661983608026751009801

146. Divide by 9:

1. 15443	7. 13540	13. 39128	19. 53080	25. 29123
2. 17867	8. 44547	14. 29109	20. 44064	26. 20367
3. 27364	9. 88432	15. 24389	21. 41229	27. 23389
4. 72351	10. 76302	16. 66093	22. 45562	28. 35198
5. 11128	11. 68134	17. 75623	23. 89054	29. 55555
6. 55408	12. 47562	18. 64224	24. 76323	30. 44444

147. Multiply:

1. 7865×10 8079×10 80563×10 96532×10

Short Method. When the multiplier is ten, the product is obtained by annexing zero to the multiplicand.

2. 89736×10 78895×10 45838×10 40009×10

Find quotients:

3. $28930 \div 10$ $26845 \div 10$ $870470 \div 10$ $693879 \div 10$

Short Method. Cut off one figure from the right of the dividend. The part cut off is the remainder and the rest of the dividend is the quotient.

4. $7630456 \div 10$ $3987652 \div 10$ $3101487 \div 10$

148. Multiply by 11:

1.	89723	3.	830976	5.	385047	7.	748693
2.	65049	4.	394857	6.	629875	8.	480019

149.   MENTAL EXERCISE.

$11 \div 11 = 1$	$16 \div 11 = 1,\ 5$ rem.	$21 \div 11 = 1,\ 10$ rem.
$12 \div 11 = 1,\ 1$ rem.	$17 \div 11 = 1,\ 6$ rem.	$22 \div 11 = 2$
$13 \div 11 = 1,\ 2$ rem.	$18 \div 11 = 1,\ 7$ rem.	$23 \div 11 = 2,\ 1$ rem.
$14 \div 11 = 1,\ 3$ rem.	$19 \div 11 = 1,\ 8$ rem.	$24 \div 11 = 2,\ 2$ rem.
$15 \div 11 = 1,\ 4$ rem.	$20 \div 11 = 1,\ 9$ rem.	$25 \div 11 = 2,\ 3$ rem.

Beginning with 26, complete the table to $132 \div 11$, each pupil giving one number divided by 11.

150. Divide by 11:

1.	25826	4.	899604	7.	567802	10.	9800457
2.	20441	5.	283563	8.	900456	11.	2394836
3.	37838	6.	190009	9.	404040	12.	1938479

151. Find the products:

1.	7809×12	9.	63749×12
2.	9489×12	10.	34952×12
3.	7618×12	11.	6784×12
4.	9284×12	12.	56900×12
5.	29848×12	13.	61809×12
6.	72952×12	14.	19072×12
7.	47836×12	15.	72839×12
8.	39647×12	16.	85535×12

152.   MENTAL EXERCISE.

$12 \div 12 = 1$	$18 \div 12 = 1$, 6 rem.	$24 \div 12 = 2$
$13 \div 12 = 1$, 1 rem.	$19 \div 12 = 1$, 7 rem.	$25 \div 12 = 2$, 1 rem.
$14 \div 12 = 1$, 2 rem.	$20 \div 12 = 1$, 8 rem.	$26 \div 12 = 2$, 2 rem.
$15 \div 12 = 1$, 3 rem.	$21 \div 12 = 1$, 9 rem.	$27 \div 12 = 2$, 3 rem.
$16 \div 12 = 1$, 4 rem.	$22 \div 12 = 1$, 10 rem.	$28 \div 12 = 2$, 4 rem.
$17 \div 12 = 1$, 5 rem.	$23 \div 12 = 1$, 11 rem.	$29 \div 12 = 2$, 5 rem.

Complete the table to $144 \div 12$.

153. Divide by 12:

1. 6384	7. 49673	13. 7864532	19. 9860004
2. 2952	8. 83440	14. 1111111	20. 7581924
3. 29548	9. 970836	15. 9999999	21. 9676893
4. 98345	10. 483974	16. 3568903	22. 6892853
5. 54389	11. 298375	17. 2494967	23. 4786900
6. 87432	12. 483762	18. 8607859	24. 6927465

MISCELLANEOUS PROBLEMS.

154. 1. John says, " Four times my money is $1.00 "; how many cents has he?

2. What will 12 pounds of soap cost at $12\frac{1}{2}$ cents a pound?

3. 75 cents is $\frac{1}{2}$ of my money; how much money have I?

4. What was received in payment for 867 desks sold at $9 each?

5. Rugs which cost $7.50 each, were sold for $8.00 apiece; what was the profit on each rug?   On 12 rugs?

6. What is the cost of 36 bolts of ribbon at $9 a bolt, and 25 yds. of velvet at $5 a yard?

7. A merchant bought 9 pieces of merino, each piece containing 45 yards. After selling 135 yards, how many dress patterns of 9 yards each had he left?

8. A clerk saves $9 a month; how many months will it take him to save $684?

9. Bought 882 acres of woodland. After clearing one-ninth of it, I sold the remainder at $9 an acre; how much did I receive?

10. If you have $238 when you are 18 years old, and save $49 each year until you are 27, how much money will you then have?

11. A lady having $125, bought a cloak for $75, and 7 yards of silk at $2 a yard; how much money had she left?

12. A coal-dealer bought 11 tons of coal for $126.50 and sold it at $12 a ton; did he gain or lose? How much?

13. A hotel-keeper bought 98 pounds of crackers at 8 cents a pound, and 138 loaves of bread at 4 cents a loaf; how much did he pay for both?

14. At 5 cents a quart, what is the value of a barrel of cider containing $31\frac{1}{2}$ gallons?

15. A manufacturer received $2688 for gloves, at the rate of $12 per dozen pairs; how many dozen pairs did he sell?

16. How many days are there in eleven years?

17. A shoe merchant received $288 for 12 dozen pairs of shoes; what was the value of one dozen pairs? Of one pair?

18. $37,863 were received in three months for coal sold at $9 a ton; how many tons were sold?

19. An office building valued at $600,000 is owned by a company of 12 men; the rental received each year is $30,000. What is each man's share of the rent?

20. How many barrels of flour, at $9 per barrel, will pay for 60 cords of wood, at $12 per cord?

21. 12 men can do a piece of work in 20 weeks; in how many weeks can one man do the same work?

22. How many revolutions will be made by a wheel 12 feet in circumference in running 52,800 feet?

ADDITION AND SUBTRACTION BY ENDINGS.

155.   **4 + 7.**

Add:

4	14	24	34	44	54	64	74	84	94
7	7	7	7	7	7	7	7	7	7

Make a subtraction table, taking 7 from each of the results of the above addition.

(1)	(2)	(3)	(4)	(5)	(6)
634	646	689	956	497	90
476	443	344	734	973	994
634	574	765	275	748	427
446	437	337	347	480	99
667	649	784	564	39	749
743	767	369	449	3	969 .
367	424	244	992	989	793
473	396	936	738	927	739
452	787	879	788	697	77
849	567	652	253	47	64

7. $477 + 743 + 267 + 344 + 598 + 442 + 675 + 484 + 834 + 646 = ?$

8. Add 594, 764, 432, 474, 544, 347, 854, 334, 788, and 568.

9. Find the amount of 9, 93, 838, 297, 944, 469, 93, 739, 479, and 60.

10. Find the sum of 9, 34, 897, 378, 949, 983, 639, 84, 1, 78, and 78.

11. $44 + 987 + 909 + 738 + 493 + 989 + 37 + 704 + 989 + 44 + 7 = ?$

12. $839 + 799 + 3 + 488 + 937 + 784 + 478 + 842 + 649 + 83 + 9 + 9 = ?$

13. Add 39, 899, 980, 97, 734, 97, 473, 648, 783, 68, 4, 7.

REVIEW.

156. Add rapidly, giving the ending figures first, then the whole sum:

6	9	7	8	5	9	7	9
22	32	42	52	62	72	82	92

9	8	7	6	9	7	8	9
23	33	43	53	63	73	83	93

5	4	6	7	5	7	6	7
24	34	44	54	64	74	84	94

4	4	4	4	4	4	4	4
34	46	55	67	74	85	95	37

Add the following lines, beginning at the left:

7, 7, 4, 2, 4, 4, 2, 5, 4, 1, 4, 5, 1, 5, 3, 3, 3.
8, 8, 4, 6, 4, 4, 4, 2, 5, 4, 1, 5, 4, 2, 8, 3, 2, 9.

5, 4, 4, 9, 8, 4, 5, 1, 4, 4, 2, 9, 3, 7, 2, 3, 6, 4.
7, 4, 5, 4, 7, 4, 7, 3, 3, 6, 5, 4, 1, 9, 3, 2, 6, 7.
8, 3, 7, 3, 4, 4, 2, 8, 3, 3, 4, 3, 8, 7, 4, 8, 3, 2.
9, 3, 9, 9, 8, 3, 7, 3, 6, 4, 4, 4, 1, 7, 4, 5, 4, 9.

157.   **4 + 8.**

4	14	24	34	44	54	64	74	84	94	104
8	8	8	8	8	8	8	8	8	8	8

Make a subtraction table, taking 8 from each of the results of the above addition.

(1)	(2)	(3)	(4)	(5)	(6)
448	283	184	444	979	89
662	224	626	666	887	48
448	484	484	444	222	994
662	644	226	636	348	479
848	882	484	433	563	749
262	244	826	447	387	984
448	866	284	384	744	936
880	288	841	327	399	994
526	447	28	773	393	649
38	267	939	668	968	99

7. Add 384, 384, 348, 314, 958, 328, 733, 493, 889, and 269.

8. Find the sum of 799, 423, 853, 124, 489, 534, 928, 298, 988, and 464.

9. $84 + 47 + 978 + 288 + 784 + 349 + 899 + 892 + 699 + 34 + 48 + 84 = ?$

10. Find the amount of 83, 387, 938, 974, 949, 889, 398, 794, 448, 983, 348, 87, 4.

158. Subtract:

1. 2442 − 2546	7. 53320 − 1777	13. 37404 − 6476
2. 13123 − 1666	8. 44320 − 2676	14. 18805 − 3076
3. 43454 − 1456	9. 39131 − 7777	15. 99405 − 6066
4. 23455 − 1666	10. 68442 − 6767	16. 97503 − 6707
5. 35656 − 4666	11. 49563 − 6777	17. 19505 − 6007
6. 60003 − 2666	12. 18004 − 7777	18. 13006 − 1007

MISCELLANEOUS PROBLEMS.

159. 1. Two numbers, taken together, make 1000. One of the numbers is 320; what is the other number?

2. Find the difference between 534 and 3034.

3. Subtract 12 from 1000.

4. An excursion train left Chicago for Niagara Falls with 543 passengers.   On the way 254 passengers left the cars and 162 came aboard; how many were on the train when it reached Niagara Falls?

5. Morris paid 50 cents for a hammer, $1.25 for a saw, 75 cents for a file, 25 cents for a gimlet, 25 cents for a screw-driver, $1 for an auger, 50 cents for a chisel, and $2 for a plane; how much did his tools cost him?

6. If he should sell his tools for $6, would he gain or lose?   How much?

7. The sum of 3 numbers is 1345.   Two of the numbers are 300 and 400; what is the third?

8. From a cask containing 900 gallons of kerosene I sold at different times 200 gallons, 165 gallons, and 150 gallons; how many gallons remained in the cask?

9. A gentleman bought a 1000-mile ticket on a railroad for the use of his wife, his daughter, his son, and himself. His wife rode 233 miles, his daughter 289 miles, his son 221, and he himself rode the remainder; how many miles did he ride?

10. A farmer raised 225 bushels of blue-grass seed.   He sowed 74 bushels, and sold 95 bushels; how many bushels had he left?

11. A has $629, B has $865, C has $786, and D has as much as A, B, and C; how many dollars has D?

12. A has $2400, B has $500 less than A, C has $150 less than B; how much money has C?

MULTIPLICATION.

When the Multiplier Consists of More Than One Order.

160. Multiply 234 by 25.

234 (multiplicand)
25 (multiplier)
———
5 times 234 = 1170
20 times 234 = 468
———
25 times 234 = 5850 (product)

(1) 234 units multiplied by 5 = 1170 units.

(2) 234 units multiplied by 2 tens (or 20) = 468 tens, or 4680 units. The 8 tens in this product are written in tens' place, the 6 hundreds in hundreds' place, and the four thousands in thousands' place. (It is not necessary to write the zero as the right hand figure of this product, as 8 tens means 80 units.)

(3) 1170 + 4680 = 5850.

NOTE.—The process of multiplication may be taught as given above without further explanation.   If it is thought best to make a more extended study of the process, the following method may be useful:

5 times 234	= 1170	(1st partial product)
20 times 4	= 80 ⎫	
20 times 3 tens	= 600 ⎬	
20 times 2 hundreds	= 4000 ⎭	

4680 (2d partial product)

1170 + 4680 = 5850 (product).

Find products:

1.	4697×26		13.	1086×97
2.	8309×28		14.	8594×85
3.	3597×34		15.	9457×69
4.	4318×28		16.	3749×58
5.	7906×47		17.	4008×37
6.	6708×39		18.	8096×59
7.	8009×95		19.	9085×68
8.	7926×87		20.	6927×74
9.	0193×68		21.	9619×47
10.	9658×76		22.	6538×87
11.	9037×98		23.	7108×98
12.	8395×79		24.	8693×80

In example 24, multiply by 8 and annex one cipher.

UNITED STATES MONEY.

161. Read the following:

$426.37	$4003.90	$50035.05
$200.02	$9040.09	$16200.15
$187.07	$1919.19	$70017.17

Express in figures:

Nine hundred sixty-seven dollars eight cents.

Fifty-two thousand eleven dollars seven cents.

Forty-one thousand eleven dollars seven cents.

Eleven thousand one hundred dollars one cent.

What will 4 barrels of flour cost, at $6.80 a barrel?

$6.80, cost of one barrel.

4
___

$27.20, cost of 4 barrels.

Multiply as in simple numbers, and if there are cents in the multiplicand, point off two places for cents in the product.

Find products:

1. $16.15 × 3	4. $286.04 × 3	7. $0.89 × 4
2. $26.10 × 2	5. $480.70 × 4	8. $0.75 × 3
3. $45.01 × 5	6. $0.85 × 5	9. $0.90 × 5

Multiply:

10. $9.50 by 48	13. $8.72 by 75	16. $16.87 by 68
11. $10.54 by 36	14. $7.96 by 87	17. $20.35 by 95
12. $12.54 by 65	15. $11.84 by 96	18. $35.62 by 76

EXERCISE.

162. 1. There are 24 rows of trees in an orchard and 196 trees in each row; how many trees does it contain?

2. There are 24 hours in a day; how many hours are there in a year?

3. If a ton of coal costs $9.75, what must I pay for 95 tons?

4. If there are 78 school buildings in a city and an average of 690 pupils in each building, how many pupils are there in all the schools of the city?

5. There are 144 pens in a box; how many pens are there in 75 boxes?

6. If flour is selling at $5.75 a barrel, what is the value of 85 barrels?

7. A man earns $175 a month; how much does he earn in 3 years?

8. If there are 196 pounds of flour in a barrel, how many pounds do 65 barrels contain?

9. Albert earns $10.50 a week; how much does he earn in a year?

10. There are 5280 feet in a mile; how many feet are there in 98 miles?

ADDITION AND SUBTRACTION BY ENDINGS.

163.   **4 + 9.**

Add:

4	14	24	34	44	54	64	74	84	94	104
9	9	9	9	9	9	9	9	9	9	9

Make a subtraction table, taking 9 from each of the results of the above addition.

(1)	(2)	(8)	(4)	(5)	(6)
422	222	499	998	979	694
649	494	911	499	943	948
961	616	144	794	468	498
199	949	966	948	797	989
311	161	149	497	343	894
449	494	941	979	879	347
261	616	124	994	698	984
994	949	943	649	44	498
444	337	228	47	9	43
565	717	828	4	50	38

7. Add 98, 949, 899, 981, 444, 96, 974, 443, 78, and 68.

8. Find the amount of 949, 377, 994, 899, 448, 79, 794, 948, 98, and 744.

9. Find the sum of 998, 874, 949, 467, 94, 848, 78, 894, 749, 87, 44, and 9.

10. $78+90+949+478+44+909+887+94+989+708+79+3 = ?$

11. $84+939+47+874+478+848+869+44+989+787+44+20 = ?$

12. $44+969+448+99+794+447+74+878+849+94+49+489 = ?$

164. Subtract:

1. 24321 − 2878	18. 39705 − 16706
2. 16653 − 388	19. 10000 − 6117
3. 37304 − 5888	20. 69676 − 5767
4. 48765 − 4878	21. 49075 − 7076
5. 29530 − 4878	22. 29640 − 6777
6. 14878 − 7807	23. 90653 − 3767
7. 88676 − 17878	24. 20412 − 7777
8. 19644 − 888	25. 10586 − 5767
9. 20595 − 5468	26. 70001 − 4006
10. 60677 − 6878	27. 80076 − 2076
11. 69004 − 10768	28. 70604 − 5075
12. 78002 − 7834	29. 60243 − 4767
13. 44320 − 1667	30. 59456 − 7537
14. 36543 − 4757	31. 17653 − 2767
15. 17654 − 5667	32. 69114 − 7116
16. 28065 − 6776	33. 80000 − 67
17. 38345 − 14677	34. 91011 − 8927

EXERCISE.

165. 1. A man bought a coat for $24, a hat for $5, a pair of shoes for $6, and a cravat for $1.50; how much did they all cost?

2. I give a fifty-dollar bill in paying an account of $36.37; how much change should I get?

3. The difference between two numbers is 1160. The smaller number is 8340; what is the larger number?

4. Washington was born in 1732; in what year was he 57 years old?

5. 260 bushels of potatoes is 55 bushels more than a grocer sold during the month of September; how many bushels did he sell?

6. Bought 30 yards of cloth for $96.90, 20 yards of carpet for $40, and two pairs of curtains for $16.50; what did all cost?

7. Bought a farm for $13716, and sold it for $13379; did I gain or lose?   How much?

8. A saleswoman earns $0.89 a day, and her expenses are $3.75 a week; how much does she save in a week?

9. I bought a house for $6500, spent $1876 in improvements, and then sold it for $9155; how much did I gain?

10. Of a railroad 2465 miles long, 1266 miles are double track; how many miles are single track?

MENTAL EXERCISE.

166. 1. How many days are there in 9 weeks?

2. How many six-inch pencils can you cut from 54 inches of lead?

3. The minute hand goes round the dial in an hour; how many minutes is it in passing over $\frac{1}{12}$ of this space?

4. A confectioner put up 52 pounds of candy in 8 boxes of equal size; how many pounds did each box contain?

5. The water in a tank is 72 inches deep; how many feet deep is it?

6. $7\frac{1}{2}$ pecks of beans are how many quarts?

7. Bessie had 54 cents; she spent 9 cents for envelopes. The remainder of her money will pay for how many street-car rides, if she pays 5 cents each time?

8. A farmer having 56 bushels of potatoes, planted $\frac{1}{4}$ of them; how many bushels did he plant? How many pecks?

9. Frank had 70 cents; he spent $\frac{1}{7}$ of it for a ball of twine, $\frac{1}{5}$ for some nails, and with the remainder he bought a Reader; what did his Reader cost?

10. If a cook uses 6 eggs each day, how many days will 8 dozen last?

11. How many sides have two triangles? How many plants will be needed for two triangular garden plats, if 9 are planted on each side? (Make a drawing.)

12. If a man works at his trade nine hours a day, how many hours does he work in a week?

13. 16 bushels of oats are how many pecks?

14. I bought eight yards of muslin at 7 cents a yard, and gave in payment a fifty-cent piece and a ten-cent piece; what change ought I to receive?

15. At the rate of 72 pages in 7 days, how many pages do I read in a day?

16. Ten cents, which Horace paid for his drawing book, was one-eighth of his money; how much had he?

17. A florist having 7 dozen roses, sold one-fourth of them; how many did he sell?

18. If a peck of berries costs 96 cents, how much are they a quart?

19. If you have collected 8 dozen stamps, of which ⅓ are 6-cent stamps, how many 6-cent stamps have you?

20. If 5 cents is paid for a cup of coffee, 4 cents for fish, and 2 cents for bread, what will 6 such breakfasts cost?

21. If I earn 54 dollars a month, and save ⅙ of it, in how many months will I save 72 dollars?

22. How many inches are there in 8 feet?

23. 6 dozen rosebuds will be enough for how many bouquets, if 9 are used for each one?

24. I bought 2 yards of flannel for 75 cents; what was the cost of 1 yard?

25. If 96 tiles are used for a fireplace, how many dozen are used?

HALVES, THIRDS, AND SIXTHS.
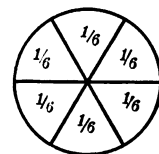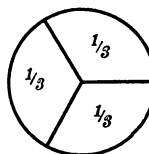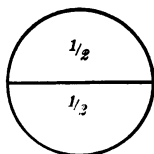
NOTE.—Use objects freely in work with fractions.

167. 1. One third of an orange is equal to how many sixths?

2. One half is how many sixths?

3. Fold a square of paper into two equal oblongs; one of the oblongs is what part of the whole?

4. Measure and draw (parallel to the line made by folding) lines which shall divide the paper square into three equal oblongs   One of these oblongs, made by drawing, is what part of the whole square?

5. How does one of these oblongs compare in size with $\frac{1}{2}$ the square?   Which is larger $\frac{1}{2}$ or $\frac{1}{3}$?

6. A third and half of a third will make what part of the whole square?

7. Fold your square into six equal oblongs.   One of the oblongs is what part of the whole square?

8. $\frac{3}{6}$ are what part of the whole? $\frac{1}{2}$ is equal to how many sixths?

9. $\frac{3}{6}$ are what part of the whole?

10. Take away $\frac{1}{3}$ of the square; how many sixths are left?

168. 1. Draw an oblong on your slate; divide it into six equal oblongs.   One of these is what part of the whole?

2. Three of the small oblongs are what part of the large one?

From your drawing find the answers to these questions:

3. $\frac{1}{3}$ and $\frac{1}{6}$ are how many sixths?

4. $\frac{2}{6}+\frac{1}{3}$ are how many sixths?

5. $\frac{1}{2}+\frac{1}{3}$ are how many sixths?

6. $\frac{1}{2}+\frac{1}{3}=?$	10. $\frac{1}{2}+\frac{1}{6}=?$	14. $\frac{5}{6}-\frac{5}{6}=?$	18. $\frac{5}{6}-\frac{1}{3}=?$
7. $\frac{2}{6}+\frac{1}{3}=?$	11. $\frac{1}{2}+\frac{2}{6}=?$	15. $\frac{5}{6}-\frac{1}{3}=?$	19. $\frac{4}{6}-\frac{1}{2}=?$
8. $\frac{1}{6}+\frac{2}{3}=?$	12. $\frac{3}{6}+\frac{1}{2}=?$	16. $\frac{5}{6}-\frac{1}{2}=?$	20. $\frac{5}{6}-\frac{2}{3}=?$
9. $4\times\frac{1}{6}=?$	13. $3\times\frac{1}{3}=?$	17. $6\times\frac{1}{6}=?$	21. $3\times\frac{2}{6}=?$

22. $\frac{4}{6}$ are how many thirds?

23. $\frac{3}{6}$ are how many halves?

24. $\frac{2}{6}$ are how many thirds?

169. 1. A grocer bought a cheese, of which he sold $\frac{1}{6}$ on Monday, and $\frac{1}{3}$ on Tuesday; what part of the whole cheese remained unsold?

2. Henry is 24 miles from home. In returning, he rides $\frac{1}{3}$ of the distance on his bicycle, $\frac{2}{3}$ on horseback, and walks the remainder; how many miles does he walk?

3. 12 cents is half my money; how many cents have I? Two times the half of anything equals what?

4. 6 cents is $\frac{1}{3}$ of Ella's money; how many cents has she? 3 times $\frac{1}{3}$ equals what?

5. Find $\frac{1}{3}$ of 2. Take two squares. Fold each into three equal oblongs. Divide these two squares equally among three children. One child receives what part of the whole?

6. Place the oblongs so as to form the two squares again, and find the answers to these questions: $\frac{1}{3}$ of 2 squares is what part of one square? $\frac{1}{3}$ of 2 is what part of 1?

7. $\frac{1}{3}$ of 2 cakes is what part of one cake? $\frac{1}{3}$ of 2 pineapples is what part of 1 pineapple?

8. Divide 2 pies equally among three visitors; how much will each receive? (Picture.)

170. Learn the following table:

$\frac{1}{5}$ of 10 = 2	$\frac{1}{2}$ of 25 = 12$\frac{1}{2}$	$\frac{1}{3}$ of 100 = 33$\frac{1}{3}$
$\frac{1}{4}$ of 10 = 2$\frac{1}{2}$	$\frac{1}{4}$ of 25 = 6$\frac{1}{4}$	$\frac{2}{3}$ of 100 = 66$\frac{2}{3}$
$\frac{1}{3}$ of 10 = 3$\frac{1}{3}$	$\frac{1}{4}$ of 50 = 12$\frac{1}{2}$	$\frac{1}{8}$ of 100 = 12$\frac{1}{2}$
$\frac{2}{3}$ of 10 = 6$\frac{2}{3}$	$\frac{3}{4}$ of 50 = 37$\frac{1}{2}$	$\frac{1}{12}$ of 100 = 8$\frac{1}{3}$
		$\frac{1}{6}$ of 100 = 16$\frac{2}{3}$

CHAPTER VI.

MULTIPLICATION AND DIVISION.

171. LONG DIVISION.

Divide 2688 by 12.

Short Method.

12) 2688

224 (quotient)

The process of Long Division is the same as that of Short Division, excepting that the work is written in full.

2600 contains 12, two hundred times, with 2 hundreds remaining undivided.

Long Method.

12) 2688 (224 (quotient)

24

28
24

48
48
----

28 tens contains 12, two tens times (20 times), with 4 tens remaining undivided.

48 units contains 12, four times. The result is 200 + 20 + 4 = 224.

$$12) 2688 (200 \atop $$

$$\left.\begin{array}{l} 2400 \quad 20 \\ \overline{288} \quad 4 \end{array}\right\} = 224$$

240

48
48

EXERCISE.

172. Divide the following numbers by 21:

Use the left hand figure of the divisor as the trial divisor.

1.	672	5.	961	9.	9266
2.	655	6.	8862	10.	7654
3.	483	7.	6552	11.	9794
4.	252	8.	7205	12.	8319

13.	2043	25.	6732	37.	2026
14.	3791	26.	8493	38.	9032
15.	8359	27.	3048	39.	4876
16.	2043	28.	8065	40.	7654
17.	7482	29.	9271	41.	5437
18.	6944	30.	1839	42.	3999
19.	8752	31.	1692	43.	8763
20.	9342	32.	9437	44.	4472
21.	3484	33.	8874	45.	9652
22.	5184	34.	1986	46.	3698
23.	1249	35.	2016	47.	4271
24.	1988	36.	2019	48.	2039

EXERCISE.

173. Divide 32019 by 31.

```
31 ) 32019 ( 1032
     31
    ----
     101
      93
    ----
      89
      62
    ----
      27 rem.
```

The divisor is not contained in the second partial dividend. Write zero in the quotient and annex the next figure of the dividend, which gives the partial dividend 101.

Divide the following numbers by 31:

1.	33065	9.	30298	17.	18297	25.	20081
2.	34139	10.	30179	18.	28269	26.	30109
3.	32098	11.	30421	19.	19134	27.	41006
4.	34129	12.	30568	20.	17698	28.	50963
5.	34149	13.	30671	21.	15982	29.	81900
6.	34108	14.	30897	22.	25769	30.	90191
7.	36128	15.	30086	23.	22109	31.	20018
8.	30192	16.	31008	24.	19987	32.	11009

EXERCISE.

174. Find products:

1.	3845×64	17.	9106×78
2.	2762×85	18.	8009×41
3.	9381×36	19.	5970×93
4.	7469×94	20.	6715×28
5.	8309×87	21.	8510×99
6.	7670×98	22.	9296×70
7.	9875×36	23.	5438×51
8.	4319×71	24.	2914×98
9.	3007×69	25.	9009×76
10.	6219×92	26.	6597×98
11.	6101×76	27.	7850×49
12.	1990×81	28.	9687×19
13.	9799×19	29.	4896×87
14.	8423×84	30.	8910×93
15.	1906×65	31.	9768×95
16.	7254×37	32.	8007×97

EXERCISE.

175. Divide by 21:

1.	15960	4.	13242	7.	64692	10.	13455
2.	17640	5.	10933	8.	147856	11.	9879
3.	9898	6.	12790	9.	190274	12.	14291

Divide by 31:

13.	23584	16.	14287	19.	281170	22.	279930
14.	21405	17.	29159	20.	187240	23.	218567
15.	15207	18.	21407	21.	126520	24.	188815

Divide by 41 :

25.	31529	27.	28059	29.	34826
26.	38800	28.	32570	30.	249690

31.	370667	33.	94826
32.	388001	34.	149690

Divide by 51 :

35.	34578	37.	47655	39.	35565
36.	43163	38.	38175	40.	25319

41.	19357	43.	34704
42.	46217	44.	360060

EXERCISE.

176. Divide by 24 :

1.	8747	4.	15571	7.	19384	10.	18975	13.	19678
2.	30313	5.	23225	8.	8897	11.	97697	14.	89394
3.	17712	6.	18456	9.	22580	12.	8758	15.	75639

Divide by 34 :

16.	26735	18.	29165	20.	33082
17.	25475	19.	20266	21.	28807

22.	26746	24.	28943
23.	26887	25.	86742

EXERCISE.

177. 1. At $21 an acre, how many acres of land can be purchased for $5187?

2. What will 1296 acres of land cost at $45 an acre?

3. If a man earns $24 a week, in how many weeks can he earn $1248?

4. What is the cost of 9560 pounds of butter, bought by a commission house, at 18 cents per pound?

5. Mr. A spent $1464 for trees at $24 a dozen; how many dozen did he buy?

6. If a man saves $31 a month, in how many months can he save $1488?

7. What is the value of 950 bushels of tomatoes at 70 cents per bushel?

8. If I travel at the rate of 35 miles an hour, in how many hours can I complete a journey of 1225 miles?

9. A commission house sold 2980 bushels of potatoes at 65 cents per bushel; what was the amount of money received?

10. 45 feet is the width of a lot, valued at 85 dollars per foot; what is the value of the lot?

11. The multiplicand is 964; the multiplier is 98; what is the product?

12. The product is 9867480; the multiplier is 95; what is the multiplicand?

13. The divisor is 95; the quotient is 9684; what is the dividend?

14. The dividend is 1667120; the quotient is 65; what is the divisor?

ADDITION AND SUBTRACTION BY ENDINGS.

178.   **5 + 5 and 5 + 6.**

Add

5	15	25	35	45	55	65	75	85	95
5	5	5	5	5	5	5	5	5	5

5	15	25	35	45	55	65	75	85	95
6	6	6	6	6	6	6	6	6	6

Make a table, subtracting 5 from each of the results above. Subtract 6 from the same numbers.

Add:

(1)	(2)	(3)	(4)	(5)	(6)
536	266	694	594	598	964
554	544	557	692	657	798
656	556	654	887	454	457
455	654	265	446	559	754
561	465	725	95	656	489
543	545	645	769	982	835
655	556	565	625	694	496
445	634	42	843	848	758
644	426	487	89	87	458
142	665	67	64	74	54

Add:

7. 444, 788, 656, 565, 989, 936, 482, 744, 568, 7, 54.
8. 99, 459, 855, 595, 644, 976, 65, 626, 848, 89, 53.
9. 75, 896, 559, 60, 969, 982, 444, 688, 655, 57, 859.
10. 458, 764, 997, 456, 762, 534, 678, 745, 756, 57, 3.

179. **5 + 7.**

Add:

5	15	25	35	45	55	65	75	85	95
7	7	7	7	7	7	7	7	7	7

Make a subtraction table, taking 7 from each of the results of the above addition.

Add:

	(1)	(2)	(3)	(4)	(5)	(6)
	567	312	553	469	495	354
	537	735	525	795	898	557
	753	375	735	986	975	585
	355	535	355	748	756	526
	757	557	755	275	389	959
	373	753	335	475	75	147
	535	377	555	855	726	743
	555	533	651	581	847	494
	583	876	958	68	87	299
	254	516	778	8	57	359

Add:

7. 789, 572, 757, 484, 979, 834, 548, 674, 668, 898.
8. 457, 756, 973, 724, 596, 745, 485, 839, 579, 74.
9. 479, 620, 799, 239, 497, 775, 48, 797, 872, 99, 4.
10. 79, 20, 745, 284, 497, 872, 954, 787, 844, 79, 59.
11. 975, 726, 548, 875, 775, 239, 443, 878, 797, 775, 90.

180.   **5 + 8.**

Add:

5	15	25	35	45	55	65	75	85	95
8	8	8	8	8	8	8	8	8	8

Make a subtraction table, taking 8 from each of the results of the above addition.

Add:

(1)	(2)	(3)	(4)	(5)	(6)
325	225	455	799	297	589
855	555	555	578	855	898
255	255	385	888	485	942
558	355	225	55	874	984
452	835	555	988	447	978
855	225	555	499	869	429
225	855	865	955	88	857
558	555	201	447	652	542
852	353	555	75	785	89
543	345	437	6	68	4

Add:

7. 979, 944, 577, 647, 962, 875, 225, 848, 2, 88, 955.

8. 945, 973, 878, 223, 755, 274, 855, 955, 84, 89.

9. 475, 647, 779, 247, 362, 875, 57, 878, 585, 89, 9.

10. $75 + 426 + 858 + 962 + 289 + 528 + 872 + 824 + 648 + 87 + 54 = ?$

Find the sum of:

11. 859, 354, 46, 975, 98, 887, 25, 997, 79, 8, 4.

12. 789, 290, 459, 878, 782, 437, 894, 53, 607, 6, 5.

MENTAL EXERCISE.

181. 1. If 4 pounds of chocolate cost 50 cents, how many cents is it a pound?

2. If a man travels 15 miles in 3 hours, how far will he travel in one hour?   In 9 hours?

3. How many ounces are there in a pound?   What will ¾ of a pound of candy cost, at 3 cents an ounce?

4. Bought $\frac{1}{4}$ bushel of apples and $\frac{1}{2}$ bushel of peaches; what part of a bushel have I? ❧

5. Bought $4\frac{2}{3}$ pounds of grapes at 6 cents a pound; how much did they cost?

6. If 3 pounds of almonds cost 25 cents, what will one pound cost? What will 5 pounds cost, at the same rate?

7. A boy gave to his sister $\frac{1}{2}$ of an orange, and to his brother $\frac{1}{2}$ as much as he gave to his sister; how much did he give to his sister?

8. If two pounds of cheese cost 36 cents, what will 1 pound cost? What will half a pound cost?

9. A bushel of corn weighs 56 pounds; what is the weight of a peck? a half peck?

10. A boy living $\frac{3}{4}$ of a mile from school, who goes home to dinner, will walk how many miles each week in going to and from school?

11. Buy 4 dozen pencils at 30 cents a dozen, and sell them at 4 cents apiece; what is gained?

12. With what you have gained, buy 2 dozen erasers and sell them at 6 cents apiece; how much do you gain this time, and how much money have you altogether?

Solve:

13. $\frac{3}{8}+\frac{1}{3}=?$	17. $\frac{3}{8}+\frac{1}{2}=?$	21. $\frac{5}{8}-\frac{1}{3}=?$	25. $4\times\frac{1}{6}=?$
14. $\frac{1}{6}+\frac{2}{3}=?$	18. $\frac{4}{8}-\frac{5}{8}=?$	22. $\frac{4}{8}-\frac{1}{2}=?$	26. $3\times\frac{1}{3}=?$
15. $\frac{1}{2}+\frac{1}{6}=?$	19. $\frac{8}{8}-\frac{1}{3}=?$	23. $\frac{5}{8}-\frac{2}{3}=?$	27. $6\times\frac{1}{6}=?$
16. $\frac{1}{2}+\frac{2}{8}=?$	20. $\frac{8}{8}-\frac{1}{2}=?$	24. $\frac{3}{8}-\frac{1}{2}=?$	28. $3\times\frac{2}{8}=?$

182. Add:

1. 88, 492, 744, 799, 277, 558, 772, 534, 887, 87, 65.

2. 599, 540, 489, 775, 957, 898, 388, 745, 764, 88, 88.

3. $544 + 868 + 454 + 334 + 558 + 663 + 854 + 156 + 594 + 288 = ?$

4. $878 + 925 + 848 + 89 + 295 + 975 + 424 + 989 + 529 + 98 + 973 = ?$

Find the sum of:

5. 989, 587, 659, 884, 497, 958, 52, 598, 844, 68, 65.

6. 799, 947, 864, 577, 959, 795, 495, 844, 577, 58, 4.

7. 559, 675, 576, 543, 76, 345, 975, 34, 486, 98, 965.

183. Subtract:

21	32	43	54	61	72	83	94	100
5	5	5	5	5	5	5	5	5

21	32	43	54	65	90	100
6	6	6	6	6	6	6

21	32	43	54	65	76	100
7	7	7	7	7	7	7

NOTE..—Do the following work in class:

Subtract: 91027300467193450014
           17263398720456901029

           23009140213068097001 3520
           12894008095619829674 6936

Subtract: 33310201010063452960013
                 12100617289113856972869
                 ─────────────────────────

EXERCISE.

184. Find the difference:

1.	4287003	2.	3010604	3.	4284006
	3650169		1720456		3639109

4.	8001641	5.	9340106	6.	5017603
	7100956		5340508		979184

7.	3596001	8.	2684302	9.	3001801
	2100998		1008697		2018697

REVIEW.

185. Read sums rapidly:

32	42	52	62	83	93	63	53	43	33	103
8	6	9	7	9	6	8	7	5	9	8

44	54	64	74	85	95	65	35	25	105
9	6	8	7	9	7	8	6	9	7

Read the differences in the above rapidly.

Add:

5, 9, 9, 2, 9, 9, 8, 4, 9, 8, 2, 7, 3, 9, 7, 9.

9, 9, 4, 9, 9, 5, 9, 7, 4, 8, 2, 9, 7, 7, 2, 2.

7, 5, 8, 9, 5, 8, 9, 4, 9, 7, 4, 6, 4, 7, 0, 8.

9, 5, 8, 9, 7, 5, 4, 5, 3, 9, 8, 4, 5, 3, 0, 7.

3, 9, 4, 4, 6, 1, 4, 6, 4, 3, 5, 3, 9, 4, 4, 3, 2, 5, 3.

4, 7, 6, 2, 3, 8, 9, 1, 5, 4, 1, 7, 4, 8, 2, 6, 4, 3, 5.

9, 9, 2, 9, 2, 9, 7, 4, 5, 4, 6, 4, 5, 4, 1, 9, 3, 8.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
854	697	576	797	799	436	478	975
376	482	648	346	423	644	584	476
785	748	542	553	853	751	558	729
456	284	345	474	124	244	867	589
755	459	856	426	489	865	984	593
556	789	464	745	534	496	949	549
752	429	984	585	928	724	579	685
596	789	459	259	296	998	844	548
756	687	695	389	988	713	859	895
456	757	659	534	464	249	679	245

9. $798 + 557 + 789 + 985 + 557 + 78 + 895 + 559 + 849 + 96 + 85 = ?$

Add:

10. 589, 457, 855, 587, 658, 545, 758, 89, 599, 99, 54.

11. 58, 79, 594, 957, 85, 474, 545, 874, 689, 77, 8.

12. 599, 759, 575, 557, 254, 788, 357, 785, 587, 78, 4.

13. 557, 640, 555, 579, 459, 808, 879, 955, 909, 87, 4.

14. 45, 575, 678, 554, 508, 370, 757, 545, 959, 86, 54.

15. 987, 895, 956, 967, 485, 54, 875, 580, 97, 9, 3.

EXERCISE.

186. 1. In what year was your schoolhouse built? How many years have passed since that time?

2. How many years have passed since the discovery of America by Columbus in 1492?

3. A farmer went to town with a load of wood, which he sold for $8. He bought 25 pounds of sugar for $2, eight pounds of raisins for $1, two pounds of tea for $1.50, and six pounds of coffee for $2.10; how much did he spend? Did he receive for his wood enough to pay for his groceries?

4. A grocer bought 50 barrels of apples and 100 boxes of peaches, for which he paid $225.   If he paid $75 for the peaches, how much did he pay for the apples?

5. Bought:

4 lb. butter,	@ 22 c.	. . . . $	
2 lb. cheese,	" 18 c.	. . . .	
3 doz. eggs,	" 15 c.	. . . .	
9 qt. milk,	" 6 c.	. . . .	
2 bu. potatoes,	" 65 c.	. . . .	
2 bu. carrots,	" 60 c.	. . . .	_____

What was the amount of my bill?

6. Bought:

9 lb. rice,	@ 7 c.	. . . . $	
2 " tapioca,	" 15 c.	. . . .	
3 " sago,	" 13 c.	. . . .	
5 " sugar,	" 9 c.	. . . .	
7 " prunes,	" 9 c.	. . . .	
3 " figs,	" 15 c.	. . . .	_____

What was the amount of my bill?

7. Bought:

4 lb. tea,	@ $1.25	. . . . $	
2 " coffee,	" .42	. . . .	
2 " raisins,	" .11	. . . .	
7 " currants,	" .09	. . . .	
5 " crackers,	" .12	. . . .	
7 " sugar,	" .08	. . . .	_____

What was the whole amount?

8. Fill in the total:

Chicago, Jan. 14, 1904.

Mr. James Hall,

   Bought of B. J. Allen & Co.,

6 papers garden seeds, @ 9¢	$ .54
2 willow baskets, @ 45¢	.90
1 hammock	4.80
1 lawn mower	6.75
1 rake	.80
1 spade	1.25

Received payment,

B. J. Allen & Co.

9. Complete the bill:

Nashville, Tenn., Feb. 10, 1904.

Mr. John Mitchell,

   Bought of J. D. Hunt & Co.,

2 lb. coffee,	@ 32 c.	. . . .	$
6 " crackers,	" 11 c.	. . . .	
3 " honey,	" 18 c.	. . . .	
1 " Japan tea		. . . .	.98
1 doz. oranges	.	. . . .	.40
1 sack flour		. . . .	3.89

Received payment,

J. D. HUNT & CO.

MULTIPLICATION AND DIVISION.

187. 1. Multiply 478 by 624.

	478 × 4 units = 1912 units
478	478 × 2 tens = 956 tens
624	478 × 6 hund. = 2868 hundreds
1912	478 × 624 = 298272 units

956   The second partial product = 9560 units. The
2868   third partial product = 286800 units. It is not
————   necessary to write the zeros, since the place in
298272 which each figure is written gives its value; 6 in
tens' place is the same as 60 units.

2. Multiply the following numbers by 624:

396, 489, 279, 486, 295, 197, 176, 294, 395, 284, 692, 986.

3. Multiply by 798:

276, 347, 468, 987, 692, 985, 569, 696, 459, 879.

4. Multiply by 718:

698, 437, 329, 492, 682, 694, 987, 962, 764, 829, 677, 276.

5. Multiply by 691:

218, 912, 986, 497, 319, 489, 637, 956, 739, 895, 989, 759.

6. Multiply by 976:

1241, 3124, 2312, 1342, 2137, 7125, 1259, 2138, 3216, 4132, 5123, 3495, 4287, 5196.

EXERCISE.

188. Divide by 43:

1. 34228	4. 29001	7. 302720	10. 261895
2. 29439	5. 34675	8. 389580	11. 174604
3. 21389	6. 347010	9. 34718	12. 302290

Divide by 53:

13.	51756	16.	44877	19.	50880	22.	42888
14.	34363	17.	32305	20.	41376	23.	39723
15.	25349	18.	33920	21.	480180	24.	36994

Divide by 54:

25.	21457	28.	41565	31.	43445	34.	21456
26.	37729	29.	37719	32.	32934	35.	37728
27.	41541	30.	48978	33.	41564	36.	32933

EXERCISE.

189. Divide by 35:

1.	16231	4.	26581	7.	31737	10.	32848
2.	22664	5.	34510	8.	31176	11.	24455
3.	32847	6.	24456	9.	16800	12.	26582

Divide by 45:

13.	35839	16.	41024	19.	43650	22.	28379
14.	31032	17.	31708	20.	38700	23.	36288
15.	43847	18.	36289	21.	22077	24.	43651

Divide these numbers by 55 and 65.

EXERCISE.

190. 1. What is the value of 8950 bushels of wheat, at 95 cents per bushel?

2. A commission house sold 75 bushels of cranberries, at $2.75 cents per bushel; how much money was received?

3. $4320 was paid to 54 men for one month's work in building a bridge; how much money did each man receive?

4. B paid $25668 for land, at $46 an acre; how many acres did he buy?

5. What is the value of 870 barrels of apples, at $3.75 per barrel?

6. A wholesale house sold 1260 pairs of blankets in one month, at $4.50 a pair; how much money was received from these sales?

7. There are 1272 pupils in a school building and 53 pupils in each room; how many rooms are there in the building?

8. The distance from A to B is 936 miles. If I travel at the rate of 36 miles an hour, in how many hours can I complete the journey?

9. When oranges are selling at $3.50 a box, what must be paid for 598 boxes?

10. $1479 was spent for rugs, at an average cost of $17 each; how many rugs were purchased?

ADDITION AND SUBTRACTION BY ENDINGS

191.   **5 + 9.**

Add:

5	15	25	35	45	55	65	75	85	95
9	9	9	9	9	9	9	9	9	9

Make a subtraction table, taking 9 from each of the results of the above addition.

Add:

	(1)	(2)	(3)	(4)	(5)
	797	958	87	768	355
	950	885	855	55	478
	545	878	87	557	587
	457	559	995	495	55
	575	949	4	954	967
	84	750	775	569	98
	895	565	957	45	755
	55	947	79	479	889
	497	787	598	89	898
	67	655	85	82	62

Add:

6. 895, 258, 978, 45, 554, 645, 546, 795, 606, 8, 4.
7. 958, 545, 758, 789, 478, 959, 570, 295, 906, 59, 4.
8. 989, 959, 575, 487, 55, 597, 897, 905, 897, 687, 75.
9. 895, 587, 798, 855, 566, 855, 975, 989, 589, 95.
10. 989, 455, 464, 955, 587, 768, 555, 789, 587, 898, 75.
11. 989, 597, 855, 867, 558, 485, 986, 505, 798, 597, 74.

(12)	(13)	(14)	(15)	(16)	(17)
325	515	585	995	959	899
598	959	515	587	575	575
512	151	954	798	689	856
955	555	151	455	552	789
195	599	959	787	784	585
915	911	191	378	499	897
255	155	515	595	585	594
457	535	995	556	348	854
575	287	277	688	787	89
977	242	347	565	465	65

<div align="center">REVIEW.</div>

192. Read sums rapidly:

32	42	52	62	83	93	63	53	43	33	103
8	6	9	7	9	6	8	7	5	9	8

44	54	64	74	85	95	65	35	25	105
9	6	8	7	9	7	8	6	9	7

Read differences rapidly.

Add:

5, 9, 9, 2, 9, 9, 8, 4, 9, 8, 2, 7, 3, 9, 7, 9.
9, 9, 4, 9, 9, 5, 9, 7, 4, 8, 2, 9, 7, 7, 2, 2.
7, 5, 8, 9, 5, 8, 9, 4, 9, 7, 4, 6, 4, 7, 0, 8.
9, 5, 8, 9, 7, 5, 4, 5, 3, 9, 8, 4, 5, 3, 0, 7.
3, 9, 4, 4, 6, 1, 4, 6, 4, 3, 5, 3, 9, 4, 4, 3, 2, 5, 3.
4, 7, 6, 2, 3, 8, 9, 1, 5, 4, 1, 7, 4, 8, 2, 6, 4, 3, 5.
9, 9, 2, 9, 2, 9, 7, 4, 5, 4, 6, 4, 5, 4, 1, 9, 3, 8.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
854	697	576	797	799	436	478	957
376	482	648	346	423	644	584	476
785	748	542	553	853	751	558	729
456	284	345	474	124	244	867	589
755	459	856	426	489	865	984	593
556	789	464	745	534	496	949	549
752	429	984	585	928	724	579	685
596	789	459	259	296	998	844	548
756	687	695	389	988	713	859	895
456	757	459	534	464	249	679	245

9. $798+557+789+985+557+78+895+559+849+96$
$+85=?$

Add:

10. 589, 457, 855, 587, 658, 545, 758, 89, 599, 99, 54.
11. 58, 79, 594, 957, 85, 474, 545, 874, 689, 77, 8.
12. 599, 759, 575, 557, 254, 788, 357, 785, 587, 78, 4.
13. 557, 640, 555, 579, 459, 808, 879, 955, 909, 87, 4.
14. 45, 575, 678, 554, 508, 370, 757, 545, 959, 86, 54.
15. 987, 895, 956, 967, 485, 54, 875, 580, 97, 9, 3.

REVIEW.

193. Add, beginning at the left:

9, 9, 4, 9, 9, 4, 7, 8, 4, 8, 3, 7, 3, 8, 6, 4.
7, 7, 9, 9, 8, 4, 8, 8, 3, 7, 3, 8, 7, 4, 6, 1.
4, 6, 7, 3, 9, 4, 9, 2, 8, 2, 7, 9, 4, 8, 8, 7.
4, 9, 9, 3, 4, 4, 6, 4, 8, 3, 7, 3, 8, 9, 9, 2.
6, 6, 6, 4, 8, 9, 4, 6, 4, 8, 7, 4, 5, 4, 7, 3.
4, 8, 9, 9, 8, 4, 6, 3, 6, 4, 3, 7, 3, 8, 2, 6.
6, 7, 6, 2, 4, 8, 3, 9, 4, 4, 9, 4, 8, 9, 3, 5.

Add:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
483	495	497	794	298	646	594	384	799
628	418	782	288	418	443	764	384	423
982	499	839	839	499	574	435	348	853
148	744	242	274	744	437	474	314	124
482	394	879	997	394	649	544	958	489
644	424	449	434	424	767	347	328	534
966	494	894	939	494	424	854	733	928
188	428	324	977	428	396	334	493	298
447	787	998	799	787	787	788	889	988
357	653	338	764	653	567	568	269	462

(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
436	989	798	873	889	999	934	498	496	787
644	322	979	845	944	844	844	844	844	444
751	877	292	149	233	455	955	467	984	485
244	713	933	952	724	488	488	327	985	575
865	442	244	347	243	319	544	943	438	824
496	983	759	732	863	942	223	168	578	493
724	524	282	444	143	243	935	484	314	899
998	554	444	244	933	354	194	343	993	422
713	627	489	536	259	386	938	348	119	644
249	978	879	878	778	979	968	798	688	549

REVIEW.

194. Read sums rapidly:

21	32	43	54	65	76	87	100
8	8	8	8	8	8	8	8

21	32	43	54	65	76	87	98	100
9	9	9	9	9	9	9	9	9

Read differences rapidly.

Subtract: 132964021347625010026
                    92467395689706110958

                   86213507010013426598312
                   63152710236647258698595

NOTE.—Do this in Class.

195. Subtract:

1. 5010026	2. 3004210	3. 9721011
2110958	1910096	8120699
4. 2937111	5. 6101034	6. 4010024
1930086	3908956	3110859
7. 6010028	8. 7010039	9. 8621011
4110869	6110699	7620388
10. 3674021	11. 2901003	12. 1807007
1690084	1889019	918069
13. 8100118	14. 7010165	15. 5900011
1909099	3927896	2574698

EXERCISE.

196. 1. Three men buy some land for $75000; the first pays $25000, and the second pays $17500; how much does the third man pay?

2. How much must I add to $12690 to enable me to buy a farm valued at $15000?

3. A has $125, B has $79 more than A, and C has as much as A and B; how much money have A, B, and C together?

4. A train travels 758 miles a day for the first three days of the week, and 695 miles a day for the remaining four days; how far has the train traveled in a week?

5. I paid $6800 for a lot and built a house which cost $9500; the street improvements cost me $500. For how much must I sell the house and lot in order to gain $2000?

6. Add 49170, 33040, 45215, and 8315; and take the sum from 265780.

7. The sum of two numbers is 185674; one of the numbers is 92750; what is the other number?

8. The difference between two numbers is 18698; one of the numbers is 9740; what is the other number?

9. The remainder is 6793; the subtrahend is 6755; what is the minuend?

10. The minuend is 7848; the remainder is 6702; what is the subtrahend?

MULTIPLICATION AND DIVISION.

197. Copy and complete the following tables:

$3\times13=$	$3\times14=$	$3\times15=$	$3\times16=$
$4\times13=$	$4\times14=$	$4\times15=$	$4\times16=$
$5\times13=$	$5\times14=$	$5\times15=$	$5\times16=$
$6\times13=$	$6\times14=$	$6\times15=$	$6\times16=$
$7\times13=$	$7\times14=$	$7\times15=$	$7\times16=$
$8\times13=$	$8\times14=$	$8\times15=$	$8\times16=$
$9\times13=$	$9\times14=$	$9\times15=$	$9\times16=$

$3\times17=$	$3\times18=$	$3\times19=$
$4\times17=$	$4\times18=$	$4\times19=$
$5\times17=$	$5\times18=$	$5\times19=$
$6\times17=$	$6\times18=$	$6\times19=$
$7\times17=$	$7\times18=$	$7\times19=$
$8\times17=$	$8\times18=$	$8\times19=$
$9\times17=$	$9\times18=$	$9\times19=$

These tables may be used as an aid in finding any term of the quotient.

EXERCISE.

198. 1. Divide by 13: 3844, 1456, 2899, 3241, 4869, 12980.

2. Divide by 14: 4899, 1386, 3287, 1642, 1196, 10896.

3. Divide by 15: 3453, 1296, 1484, 4192, 1483, 14080.

4. Divide by 16: 4686, 2825, 4242, 4339, 1509, 12243.

5. Divide by 17: 4198, 2649, 9497, 1562, 1678, 14909.

6. Divide by 18: 3584, 3291, 6183, 7139, 1796, 89010.

7. Divide by 19: 3764, 3698, 7501, 1368, 1509, 94055.

EXERCISE.

199. Divide by 26:

1.	12447	4.	8046	7.	19492
2.	24336	5.	25239	8.	24338
3.	19491	6.	12443	9.	25230

Divide by 36:

10.	24461	13.	28251	16.	38440	19.	28252
11.	32331	14.	26666	17.	33497	20.	38441
12.	35507	15.	14689	18.	32330	21.	33495

Divide by 46:

22.	22421	25.	34353	28.	32422	31.	44620
23.	34481	26.	41216	29.	41704	32.	39100
24.	18325	27.	28033	30.	36369	33.	28034

200. $8094 \times 208 = ?$

$$208 = 200 + 8$$

8094	$8094 \times 8 = 64752$
208	$8094 \times 200 = \underline{1618800}$

$$8094 \times 208 = 1683552 \text{ product.}$$

64752
16188
—————
1683552 (product).

It is not necessary to write the zeros in the second partial product. We write the 8 in hundreds' place. 8 in hundreds' place has the same value as 800 units.

Find products:

1. 2965×204	7. 3098×709	13. 3048×308
2. 3472×409	8. 4037×694	14. 6497×309
3. 5409×508	9. 6089×358	15. 3859×276
4. 5696×607	10. 2064×708	16. 9294×709
5. 2897×906	11. 2022×109	17. 6789×608
6. 3587×609	12. 4967×907	18. 3008×907

201.   EXERCISE.

To multiply by 10, 100, 1000, etc., annex as many zeros to the multiplicand as there are zeros in the multiplier.

Find products:

1. 345×10	4. 783×300	7. 249×1000	10. 369×4000
2. 386×100	5. 846×500	8. 728×2000	11. 484×7000
3. 985×100	6. 782×900	9. 689×5000	12. 299×6000

202.   EXERCISE.

To divide by 10, 100, 1000, etc., cut off from the right of the dividend as many figures as there are ciphers in the divisor. The part cut off is the remainder ; the rest of the dividend is the quotient.

Divide each of the following numbers by 10, 100, and 1000:

1. 24865	5. 46704	9. 10398	13. 65143
2. 35642	6. 39405	10. 26405	14. 84291
3. 21870	7. 38400	11. 30240	15. 75028
4. 64823	8. 96099	12. 43442	16. 63000

EXERCISE.

203. Divide by 27:

1. 9845	4. 23751	7. 21349	10. 207700
2. 12844	5. 20770	8. 22680	11. 237511
3. 17478	6. 281430	9. 218430	12. 984500

Divide by 37:

13. 17205	16. 32426	19. 29940	22. 18130
14. 23514	17. 31442	20. 32930	23. 335604
15. 24959	18. 35817	21. 299349	24. 335609

Divide by 47:

25. 17129	28. 41332	31. 32308	34. 413320
26. 36438	29. 28530	32. 40847	35. 285300
27. 37520	30. 32845	33. 41830	36. 375250

EXERCISE.

204. Divide by 57:

1. 48306	4. 28229	7. 483066	10. 282290
2. 39540	5. 51098	8. 395400	11. 510980
3. 48279	6. 55794	9. 482799	12. 557944

Divide by 67:

13.	23765	18.	32126	23.	58266	28.	408059
14.	43102	19.	56768	24.	60157	29.	540690
15.	31040	20.	42814	25.	63543	30.	467688
16.	31901	21.	56731	26.	46793	31.	635219
17.	57945	22.	65554	27.	32868	32.	648560

EXERCISE.

205. Divide by 68:

1.	29631	6.	31805	11.	59489	16.	65317
2.	23517	7.	44015	12.	46754	17.	46240
3.	43343	8.	51978	13.	66504	18.	59179
4.	36331	9.	56955	14.	61059	19.	65307
5.	50084	10.	50900	15.	64367	20.	59177

COMPARISON OF HALVES, THIRDS, FOURTHS, AND SIXTHS.

206. Into how many equal parts is this circle divided?

One of the twelve equal parts of any thing is called what?   One half of the circle is how many of these parts?

One third of the circle is how many *twelfths* of the whole circle.

¼ is how many twelfths?

⅙ is how many twelfths?

Which is more, ⅓ of a cake or ¼?   ⅓ or ½?
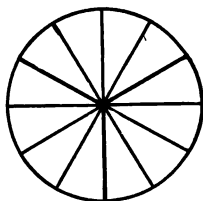
207. Look at the circle and find the answers to these questions:

NOTE.—This may also be studied with a circle cut from paper and folded into *halves*, then into *sixths*, then into *twelfths*.

1. $\frac{1}{3}$ and $\frac{1}{4}$ are how many twelfths?

2. $\frac{1}{2}$ and $\frac{1}{4}$ are how many twelfths?

3. $\frac{1}{6} + \frac{1}{4} = ?$ 6. $\frac{2}{6} + \frac{1}{3} = ?$ 9. $\frac{5}{6} + \frac{2}{12} = ?$ 12. $1\frac{2}{3} - \frac{2}{12} = ?$

4. $\frac{1}{2} + \frac{1}{6} = ?$ 7. $\frac{1}{2} + \frac{1}{3} = ?$ 10. $\frac{2}{3} + \frac{2}{12} = ?$ 13. $1 - \frac{2}{12} = ?$

5. $\frac{1}{3} + \frac{1}{12} = ?$ 8. $\frac{3}{4} + \frac{1}{3} = ?$ 11. $\frac{6}{6} - \frac{1}{12} = ?$ 14. $1 - \frac{3}{4} = ?$

15. Alice cut out $\frac{1}{3}$ of a cake to take to a picnic; her mother used $\frac{1}{2}$ of the cake for tea. What part of the whole cake was left?

16. Edgar used $\frac{1}{4}$ of a ball of twine, and his brother Carl used $\frac{1}{3}$ of the ball; what part of the whole ball was left?

208. Look at the circle, or draw a circle, and find answers:

1. $\frac{2}{12} =$ how many sixths?   4. $\frac{9}{12} =$ how many fourths?

2. $\frac{8}{12} =$ how many fourths?   5. $1\frac{9}{12} =$ how many sixths?

3. $\frac{6}{12} =$ how many halves?   6. Find $\frac{1}{3}$ of $\frac{1}{4}$ of the circle.

7. $\frac{1}{3}$ of $\frac{1}{4}$ is what part of the whole?

8. $\frac{1}{2}$ of $\frac{1}{6}$ is what part of the whole?

9. $\frac{1}{4}$ of $\frac{1}{3} = ?$ 10. $\frac{1}{3}$ of $\frac{6}{12} = ?$ 11. $\frac{1}{3}$ of $\frac{1}{2} = ?$

12. $\frac{2}{12}$ is found in $\frac{6}{12}$ how many times?

13. $\frac{1}{12}$ is found in $\frac{6}{12}$ how many times?

14. $1\frac{9}{12}$ contains $\frac{3}{12}$ how many times?

15. $\frac{8}{12}$ contains $\frac{4}{12}$ how many times?

16. 2 times $\frac{1}{4}$ are how many wholes?

17. 4 times $\frac{2}{4}$ are how many wholes?

18. $3 \times \frac{2}{12}$ are how many twelfths? How many wholes?

19. $4 \times \frac{2}{4}$ are how many wholes?

20. $4 \times \frac{3}{4} = ?$

21. Which of these forms is most used: $1\frac{9}{12}$ or $\frac{5}{6}$? $\frac{9}{12}$ or $\frac{3}{4}$?

MISCELLANEOUS PROBLEMS.

209. 1. Four boys worked together, and received $3 for a day's work. If they divide the money equally, what part will each receive? How many cents will each receive?

2. $9 is ⅓ of my money; how much money have I?

3. 5 qt. is ⅓ of all the berries James has to sell; how many quarts has he?

4. George and his two cousins received a present of 2 watermelons; they divided them equally; what was the share of each? (Make a drawing.)

5. May, John, and Ella gathered 2 pecks of nuts and divided them equally; what was each one's share?

6. George says, "61 marbles is 14 more than all I have." How many marbles has he?

7. A boy standing 30 feet from the edge of the water, shot an arrow to an island 40 feet from the shore. How far must he go in walking and rowing to get the arrow?

8. How far must he go to get the arrow and return to the place of starting?

9. Bought 10 yd. of silk for $9.50, and 10½ yd. of cloth for $5.25; how much more did the silk cost than the cloth?

10. A man owing $1000 made 2 payments, one of $180 and one of $260; how much remained unpaid?

11. A planing-mill sells 680 ft. of pine lumber, 845 ft. of poplar, 398 ft. of cherry, 480 ft. of ash, 560 ft. of walnut, 746 ft. of maple. How many feet are sold?

12. A farmer sold 26 dozen eggs at 22½ cents a dozen, and 16 pounds of butter at 28½ cents a pound. How much did he receive for them?

DIVISION.

EXERCISE.

210. Divide by 49:

1. 17353	4. 31093	7. 42972	10. 43610
2. 22725	5. 43280	8. 47479	11. 398410
3. 22922	6. 31297	9. 37247	12. 333200

Divide by 59:

13. 38072	16. 40030	19. 40041	22. 509170
14. 27582	17. 41162	20. 41182	23. 377600
15. 46393	18. 46393	21. 29311	24. 476189

EXERCISE.

211. Divide by 69:

1. 24442	6. 32104	11. 59871	16. 61871
2. 30053	7. 46506	12. 58443	17. 65469
3. 36894	8. 25991	13. 66723	18. 558210
4. 32085	9. 47442	14. 51718	19. 54547
5. 25142	10. 53015	15. 59999	20. 654690

EXERCISE.

212. Divide by 74:

1. 25597	4. 34330	7. 58201	10. 255970
2. 32227	5. 34596	8. 71669	11. 345966
3. 54503	6. 63955	9. 70125	12. 701250

Divide by 78:

13.	36140	18.	36480	23.	60040	28.	67820
14.	28439	19.	58841	24.	53769	29.	30622
15.	57079	20.	53625	25.	68598	30.	685980
16.	35595	21.	58413	26.	54500	31.	754580
17.	52641	22.	75458	27.	73991	32.	355951

ADDITION AND SUBTRACTION BY ENDINGS.

213.   **6 + 6.**

Add:

6	16	26	36	46	56	66	76	86	96
6	6	6	6	6	6	6	6	6	6

Make a subtraction table, taking 6 from each of the results obtained above.

Add:

(1)	(2)	(3)	(4)	(5)	(6)
96	965	955	7659	6989	4665
594	224	436	4444	5659	7654
662	655	596	7363	8346	4469
259	386	695	6735	3653	7653
569	596	39	6646	673	4986
756	765	566	8686	968	7866
684	939	64	7895	6366	6459
566	646	995	5563	9681	2794
437	356	668	8349	7988	9778
79	788	999	6879	7687	6899

214.   **6 + 7.**

Add:

6	16	26	36	46	56	66	76	86	96
7	7	7	7	7	7	7	7	7	7

Make a subtraction table, taking 7 from each of the results obtained above.

Add:

(1)	(2)	(3)	(4)	(5)	(6)
996	967	768	997	896	6886
767	953	437	746	9565	4553
577	667	762	654	433	5665
877	336	255	979	7766	636
676	57	646	469	6568	8387
554	656	656	463	9895	656
983	364	765	539	4647	9439
767	65	276	697	676	7475
127	889	797	678	7568	8518
899	79	959	988	989	798

Add:

 7. 979, 969, 787, 696, 969, 878, 997, 788, 979, 89.
 8. 76, 967, 899, 798, 697, 876, 968, 79, 577, 87, 9.
 9. 78, 969, 697, 786, 978, 869, 979, 779, 6, 89.
10. 707, 966, 979, 799, 689, 76, 867, 978, 706, 66.

215.   **6 + 8.**

Read endings; then sums:

26	46	36	96	56	76	66	86	106
8	8	8	8	8	8	8	8	8

Make a subtraction table, taking 8 from each of the results of the preceding addition.

Add:

(1)	(2)	(3)	(4)	(5)	(6)
969	688	98	666	67	58
667	363	887	664	932	9986
536	666	686	686	6666	4965
594	563	439	357	6256	7667
468	678	967	949	4949	6364
666	774	936	967	6677	5635
546	668	866	842	6773	6764
788	286	546	556	6758	7825
98	789	797	959	6998	899
8	869	789	688	7957	9

Add:

7. 89, 966, 878, 696, 788, 966, 787, 989, 89, 95.

8. 899, 889, 869, 688, 986, 788, 769, 969, 88, 86.

9. 689, 869, 788, 966, 687, 869, 978, 798, 789, 989.

10. 899, 998, 866, 689, 969, 789, 669, 898, 678, 668.

216.　　　　**6 + 9.**

Add:

6	16	26	36	46	56	66	76	86	96
9	9	9	9	9	9	9	9	9	9

Make a subtraction table, taking 9 from each of the results obtained above.

Add:

(1)	(2)	(3)	(4)	(5)	(6)
889	67	799	896	6	6
896	936	981	9695	65	963
986	194	616	5338	636	9616
696	619	996	664	7464	7366
868	766	268	6937	39	6987
769	759	399	9996	6699	7586
996	996	663	6668	8965	9936
897	399	567	977	8898	7999
97	717	868	7196	8766	9965
6	89	978	878	988	899

MISCELLANEOUS PROBLEMS.

217. 1. $\frac{1}{7}$ of 21 + $\frac{1}{8}$ of 40 are how many?

2. Bought 6 bars of soap for a quarter of a dollar; what will 12 bars cost at the same rate?

12 bars are 2 times 6 bars; then, 12 bars cost 2 times 25 cents, or 50 cents.

3. James had 72 cents. He spent $\frac{1}{2}$ of it for a new book, and $\frac{1}{3}$ for pencils; what part did he spend? How many cents has he left?

4. A colt was bought for $60, and sold for $1\frac{1}{2}$ times its cost; what was the gain?

5. What will $\frac{4}{5}$ of 35 pears cost, at 3 cents each?

6. What will $\frac{3}{4}$ of a gallon of vinegar cost, at 9 cents a quart?

7. A market woman bought 4 quarts of berries for 40 cents, and sold them at 6 cents a pint; how much did she gain?

8. How many minutes are there in $\frac{6}{12}$ (or $\frac{1}{2}$) of an hour?

9. $3\frac{1}{2}$ dozen are how many times 7? At the rate of 7 marbles for 9 cents, what will $3\frac{1}{2}$ dozen cost?

10. I have 66 cents. If I spend $\frac{4}{11}$ of it for a pound of butter, how much will I have left?

11. If 12 cents is $\frac{1}{4}$ of the cost of a book, what will 6 books cost?

12. At $7\frac{1}{2}$ cents an ounce, what will 4 ounces of nutmegs cost?

13. A grocer buys 8 barrels of apples, 7 times as many barrels of potatoes, and $\frac{1}{4}$ as many barrels of turnips as potatoes. How many barrels of turnips does he buy?

14. Frank had $2.80. He spent $\frac{1}{4}$ of it for a cap, $\frac{1}{7}$ of it for a ball, and with the remainder bought a book; how much did the book cost?

DIVISION.

EXERCISE.

218. Divide by 79:

1.	27985	6.	28814	11.	59160	16.	74734
2.	34394	7.	42392	12.	66881	17.	54469
3.	36081	8.	53274	13.	56441	18.	75651
4.	50993	9.	51130	14.	66976	19.	60818
5.	44619	10.	54292	15.	66191	20.	77922

EXERCISE.

219. Divide by 84:

1.	38971	4.	47676	7.	71069	10.	79548
2.	29192	5.	62693	8.	64597	11.	476760
3.	54881	6.	57557	9.	81315	12.	813150

Divide by 87:

13.	39691	16.	56338	19.	56423	22.	42369
14.	36193	17.	58716	20.	82465	23.	587160
15.	66603	18.	59582	21.	69145	24.	845800

EXERCISE.

220. Divide by 89:

1. 30718	6. 56507	11. 59965
2. 38784	7. 50244	12. 66431
3. 57300	8. 57481	13. 60034
4. 47574	9. 58280	14. 68072
5. 32415	10. 56574	15. 42443

16. 67303	21. 57749
17. 60380	22. 65729
18. 78040	23. 86137
19. 60418	24. 86910
20. 77212	25. 61379

Divide by 97:

26. 44987	29. 46240	32. 66723	35. 67784
27. 61565	30. 73397	33. 84186	36. 87096
28. 62838	31. 76290	34. 77296	37. 841860

221. **EXERCISE.**

1. Divide by 200: 36472, 22365, 96284, 87986, 76384.
2. Divide by 300: 39672, 44281, 67243, 88752, 67971.
3. Divide by 120: 36448, 29676, 32439, 28795, 78134.
4. Divide by 130: 72941, 63214, 72811, 93214, 81719.
5. Divide by 125: 76255, 83245, 96312, 84354, 26989.
6. Divide the numbers in problem 5 by 135; by 150.

UNITED STATES MONEY.

222. What is the cost of a bushel of apples, if 5 bushels are sold for $6?

This means finding one of the five equal parts of $6, or 600 cents.

$$5) \ \$6.00, \text{ cost of five bushels.}$$
$$\$1.20, \text{ cost of one bushel.}$$

If the dividend contains no cents, annex two ciphers, separated from dollars by a period. Divide as in simple numbers, and separate dollars from cents in the quotient.

1. $\frac{1}{5}$ of $416.35 = ?   4. $\frac{1}{2}$ of $219.18 = ?   7. $\frac{1}{7}$ of $625.17 = ?
2. $\frac{1}{4}$ of $312.24 = ?   5. $\frac{1}{6}$ of $916.25 = ?   8. $\frac{1}{8}$ of $909.20 = ?
3. $\frac{1}{3}$ of $700.17 = ?   6. $\frac{1}{8}$ of $813.24 = ?   9. $\frac{1}{5}$ of $805.10 = ?

223. 1. When sugar is selling at 5 cents a pound, how many pounds can be bought for $6?

This means finding the number of times 5 cents ($.05) are found in 600 cents, or $6.

$$\$.05) \ \$6.00$$
$$120$$

120 pounds of sugar at 5 cents a pound can be bought for $6.

2. At $1.30 a pair, how many pairs of gloves can be bought for $6?

$$\$1.30) \ \$6.00 \ (\ 4$$
$$5.20$$
$$80 \text{ cents remaining.}$$

4 pairs of gloves can be bought, with 80 cents remaining.

3. At $1.30 cents a yard, how many yards of cloth can be bought for $6.00?

$1.30) $6.00 (4
          5.20
          ―――――
          80 cents remaining.

Four yards of cloth can be bought for $6.00, with 80 cents remaining.

If we make a complete division and spend all the money, we have:

$1.30) 6.00 (4$\frac{8}{13}$
          6.00
          ―――
           80

4 yards and $\frac{8}{13}$ of one yard can be bought for $6.

EXERCISE.

224. 1. If 6 boxes of oranges are sold for $21, what is the value of one box?

2. I bought 20 yards of carpet, for which I paid $9.80; what was the price of one yard?

3. At 49 cents a yard, how many yards of flannel can be bought for $10.50?

4. When wheat is selling at 87 cents a bushel, how many bushels can be bought for $1200?

5. At $1.50 a barrel, how many barrels of potatoes can be bought for $60?

6. At $1.87 a yard, what will 325 yards of carpet cost?

7. $391.50 was paid for 87 bushels of clover seed; what was the cost per bushel?

8. If the clover seed was sold at $5 per bushel, what was the gain on 87 bushels?

9. Watermelons are selling at wholesale for $8 per hundred; what is the value of one melon?

10. If these melons are sold at retail at 15 cents each, what is the gain on 180 melons?

SQUARE MEASURE.

One square yard.
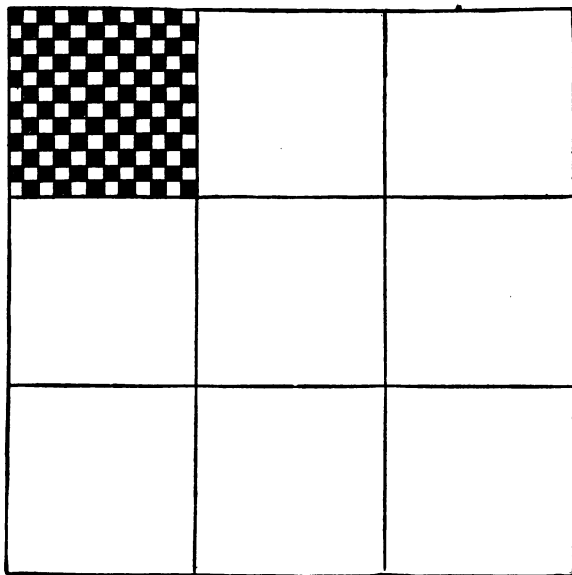
225. Mark on the schoolroom floor, or on the black-board, a square which shall measure a yard on each side. This is called a *square yard.*

Divide the square yard into 9 equal squares, as shown in the above figure. Each one of these squares measures how much on each side?

Each one of these squares is called a *square foot.*

A square yard is how many square feet?

$$9 \text{ sq. ft.} = 1 \text{ sq. yd.}$$

226. 1. 1 square foot is what part of 1 square yard?

2. If you should set out 9 geraniums in a garden bed a yard square, how much ground could you allow for each plant, allowing the same amount for each? (Make a drawing.)

3. How many square feet are there in 2 square yards?

4. How many square feet in 3 square yards?

5. Draw on the board, or on the floor of the schoolroom, 3 square feet; inclose a space 3 feet square. Which is the larger space? How many times as large?

6. Draw and compare 2 square feet with a space 2 feet square.

227. Cut out of paper a square which is 1 foot on each side. How many inches is it on each side?

Cut a square which is one inch on each side. This is called a *square inch.*

1 inch.

1 inch.

1 square inch.

This figure is a square inch in size.
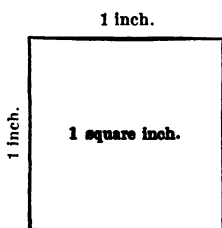
Fold your square foot of paper into square inches.

First, into how many 1-inch strips shall you fold it?

One square foot is how many square inches?

1 sq. ft. = 144 sq. in.

228. 1. Inclose a space on the board, which shall be 1 foot square. Divide this square foot into square inches. How many square inches are there?

2. Find out how many small squares of patchwork, each four inches square, can be cut from a square foot of calico.

3. How many of these squares can be cut from a square yard of calico?

4. My slate is 9 inches long and 7 inches wide; how many square inches of surface has it? There are 7 rows of 9 square inches.   7 times 9 square inches = 63 square inches.

5. Find the area (surface) of a flower bed which is 6 feet long and 2 feet wide.

6. The length of a flower bed is 5 feet; the area 15 square feet. What is the width? (Make a drawing.)

MISCELLANEOUS PROBLEMS.

229. 1. How many pounds of sugar at 6 cents a pound can be bought for 9 yards of calico at 12 cents a yard?

2. How many pairs of shoes at $3.00 a pair must be given in exchange for 30 bushels of potatoes at 50 cents a bushel ?

3. A farmer sold to a grocer 19 bushels of apples at 75 cents a bushel, and took his pay in coffee at 30 cents a pound.   How many pounds did he receive?

4. A milkman sells daily 50 quarts of milk at 4 cents a quart.   How many yards of carpet at $1.00 a yard can be bought for the milk sold in a month of 30 days?

5. For 12-days' work a workman received $24.   At that rate, how much would he receive for 18-days' work?

6. Mr. Jones sold 121 pounds of beef at 14 cents a pound, and took his pay in potatoes at 77 cents a bushel; how many bushels did he receive?

7. A grocer sold 150 pounds of sugar, at 8 cents a pound. How many pounds of tea must he sell, at 60 cents a pound, to equal the amount he received for the sugar?

8. How much can I save in a year, if I earn $140 each month for ten months, and spend $68.63 each month for 12 months?

9. What will 2 bushels of berries cost, at 12½ cents a quart?

10. A man bought 28 boxes of lemons at $5.25 per box, and sold them at $4.68 per box; how much did he lose?

11. 12 × 12 × 12 = ?

12. If I save 5 cents a day, how much shall I save in 19 years?

13. A commission house spends $30 a day for telegrams; how much is spent in 65 days?

14. If 12 men earn $72 in one week, how much will 18 men earn in the same time?
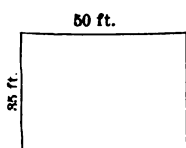
15. How many square feet of surface has the floor of the room represented by this drawing?

16. How many square yards of oil-cloth will be required to cover the floor?

ADDITION AND SUBTRACTION BY ENDINGS.

230.   **7 + 7.**

Read endings; then sums:

7	27	37	47	57	67	77	87	97	107
7	7	7	7	7	7	7	7	7	7

Make a subtraction table by using the results of the above addition and subtracting 7 from each.

Add:

(1)	(2)	(3)	(4)	(5)	(6)
777	795	779	996	998	766
377	548	637	576	8979	8735
747	877	765	455	6613	7269
496	743	659	979	6267	7637
673	676	575	192	5772	572
357	834	924	626	6386	9826
787	797	777	473	7676	7466
774	272	565	856	8476	887
637	956	776	69	997	7988
789	879	986	9	859	978

231.   **7 + 8.**

Read endings; then sums:

. 7	27	37	47	57	67	77	87	97	107
8	8	8	8	8	8	8	8	8	8

Make a subtraction table by using the results of the above addition and subtracting 8 from each.

(1)	(2)	(3)	(4)	(5)	(6)
888	888	778	669	789	6789
777	382	223	179	6846	6677
443	627	879	768	7973	9826
978	365	458	795	4769	3667
726	967	764	987	6268	9547
789	194	228	876	8666	6978
621	797	977	754	9568	8779
775	777	842	478	7599	978
647	949	498	729	975	74
689	589	798	978	89	9

232.   **7 + 9.**

Read endings; then sums:

7	17	27	37	47	57	67	77	87	97	107
9	9	9	9	9	9	9	9	9	9	9

Make a subtraction table by using the results of the above addition and subtracting 9 from each.

Add:

(1)	(2)	(3)	(4)	(5)	(6)	(7)
999	977	988	789	794	9779	97
776	296	979	189	9685	9979	686
245	872	777	756	8546	6877	399
777	187	448	257	8767	6777	769
833	956	776	764	6794	864	267
999	797	129	657	9467	6468	988
632	427	794	775	1895	9736	233
769	984	669	867	8736	798	777
647	227	778	978	6759	9797	97
989	898	976	598	988	986	89

MISCELLANEOUS PROBLEMS.

233. 1. Bought:

25	lb. of	sugar,	@	7c.
11	"	tea,	"	48c.
12	"	coffee,	"	23c.
22	"	raisins,	"	11c.
19	"	currants,	"	9c.
18	"	crackers,	"	12c.

What is the amount of my bill?

2. Bought:

12 lb.	of dried apples,	@	9c.
14 doz.	" eggs,	"	15c.
32 qt.	" milk,	"	6c.
9 bu.	" potatoes,	"	65c.
12 lb.	" butter,	"	22c.
11 lb.	" cheese,	"	18c.

What is the amount of my bill?

3. Bought:

9 bbl.	of apples,	@	$2.15
12 bu.	" plums,	"	1.20
9 "	" peaches,	"	1.75
20 "	" cherries,	"	1.05
12 "	" pears,	"	1.35
11 "	" quinces,	"	1.50

What was the whole amount?

4. Complete the bill:

CINCINNATI, O., Aug. 27, 1903.

Mr. JOHN NORRIS,

    Bought of CHARLES E. SCOTT & Co.,

3 student lamps,	@ $3.75 . . . . . $
1 doz. knives and forks,	" 4.25 . . . .
1 doz. plated teaspoons,	" 2.65 . . . .
1 refrigerator, ...	12.75
1 lawn mower, ...	6.10
2 rakes, $0.68 and $0.93, ...	
1 step-ladder, ...	1.75

Received payment,

CHARLES E. SCOTT & CO.

per JOHN M. AUSTIN.

5. Complete the bill:

Mr. JAMES C. MARTIN,

   Bought of LLOYD, WATSON & Co.,

9 yards of cassimere,	@ $2.85	. . . . $		
12 yards of pressed flannel,	" .58	. . . .		
11 yards of black silk,	" 1.65	. . . .		
2 pairs of hose,	" .75, $1.25	. .		
1 cloak, ...	. . . .	18.00		
1 pair of blankets,	. . . .	6.75		
6 handkerchiefs,	" .50	. . . .		
9 linen towels,	" .35	. . . .		

               Received payment,

                   LLOYD, WATSON & CO.
                              W.

6. A lady bought 2 yards of ribbon at 37 cents a yard, 6 yards of muslin at 19 cents a yard, 3 yards of flannel at 35 cents a yard, 5 yards of lace at 98 cents a yard, some needles for 31 cents, and a belt for 75 cents; what did her purchases amount to? Make out the bill.

7. Bought a pair of boots for $8.50, an umbrella for $3.62, a pair of gloves for $1.25, some collars for $0.75, and a hat for $4; what did all cost? Make out the bill.

8. Bought 8 yards of velvet at $1.25, 4 yards of satin at $1.85, 6 yards of Spanish lace at $0.87, and 7 yards of sateen at $0.38. Make out the bill.

9. Mr. John R. Holt bought of Hains & Co., 6 dozen oranges at 28 cents a dozen, 4 pounds of tea at 75 cents a pound, 8 lamp chimneys at 10 cents each, 10 pounds of crackers at 9 cents a pound, 5 pounds of coffee at 35 cents

a pound, and 8 pounds of starch at 20 cents a pound. Make out the bill.

10. The value of my farm is $\frac{1}{2}$ the value of my house and lot. If the farm is worth $3600, what is the value of the house and lot?

11. If the remainder is 17, the quotient 75, and the dividend 45767, what is the divisor?

12. A man, having $18432, deposited in bank $558, and with the remainder bought land at $54 an acre; how many acres did he buy?

234. 　　　　　**8 + 8.**

Read endings; then sums:

8	18	28	38	48	58	68	78	88	98
8	8	8	8	8	8	8	8	8	8

Make a subtraction table by using the results of the above addition and subtracting 8 from each.

Add:

(1)	(2)	(3)	(4)	(5)	(6)	(7)
787	698	988	878	878	97	77
439	797	675	636	889	7719	9998
978	685	799	987	386	8778	8794
828	878	479	957	879	8653	7347
584	154	988	969	787	4877	5865
748	488	843	768	687	7777	7179
886	728	788	856	995	4859	2759
686	871	788	949	297	8796	9578
738	348	919	786	798	89	628
988	899	899	877	768	7	88

235.   **8 + 9.**

Read endings; then sums:

8	18	28	38	48	58	68	78	88	98
9	9	9	9	9	9	9	9	9	9

Make a subtraction table by using the results of the above addition and subtracting 9 from each.

1. Add 899, 283, 998, 158, 895, 887, 728, 993, 947, 989.

2. Find the sum of 78, 8887, 9988, 9763, 8989, 8989, 8799, 95, 9887, 48, 988.

3. Add 767, 6512, 9899, 8269, 768, 6938, 9799, 8967, 937, 8788.

4. Find the amount of 89, 6478, 9878, 7468, 9826, 9676, 9832, 7989, 899, 7.

5. 679 + 695 + 977 + 889 + 649 + 877 + 778 + 898 + 879 + 879 = ?

Add:

(6)	(7)	(8)	(9)	(10)	(11)	(12)
899	8	9	78	767	89	679
283	839	979	8887	6512	6478	695
998	888	83	9988	9899	9878	977
158	889	848	9763	8269	7468	889
895	393	889	8989	768	9826	649
887	868	738	8799	6938	9676	877
728	474	996	95	9799	9832	778
993	987	897	9887	8967	7989	898
947	859	58	48	937	899	879
989	79	69	988	8788	7	879

MENTAL EXERCISE.

236. Subtract:

21	32	43	54	65	76	100	81	95	64
6	7	6	6	7	8	8	9	8	7

91	84	42	67	96	87	45	83	100
8	7	6	9	8	9	6	7	9

243510098290003881
184376591462388887

304009623076592800069
126993611159677863599

NOTE.—Do this in class.

Find remainders:

1. 62101011   2. 66330490   3. 32505607
   52781096   29001695   23809108

4. 35210101   5. 75004132   6. 8849060
    2671908   6217779   157386

7. 97800110   8. 87096247   9. 93808706
    1901906   3504768   76709809

10. 62001091   11. 32100901   12. 30103055
    41901698   12901967   22768996

CUBIC MEASURE.

237. How many faces has a cube?   What is the form of each face?
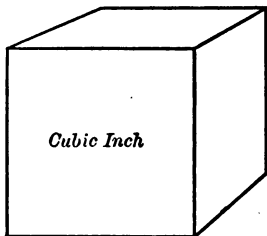
How many edges has a cube?

How many corners has a cube?

Find a cube whose edges are each one inch long.

A cube whose edges are each one inch long is called a *cubic inch.*

238. 1. Build a post of one-inch cubes; how high a post will 3 such cubes make?

2. One cubic inch is what part of the post?   2 cubic inches are what part of the post?

3. Make a post of one-inch cubes; how high a post will 4 such cubes make?

4. One cubic inch is what part of the post?   2 cubic inches are what part of the post?

5. How many cubic inches are there in 2 posts, if each contains 4 cubic inches?

6. How many one-inch cubes are there in a block 3 inches long, 3 inches wide, and 3 inches high?   (Build with inch cubes.)   How many 1-inch cubes in $\frac{1}{3}$ of the block?

7. How many cubic inches in a block of wood 4 inches long, 1 inch wide, and 1 inch thick?

8. How many cubic inches in a block 4 inches long, 2 inches wide,
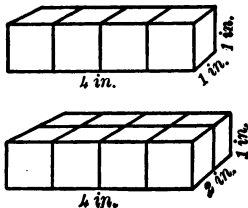
and 1 inch thick? How many rows
of 4 cubic inches each?

9. How many cubic inches in a
block 4 inches long, 2 inches wide,
and 2 inches thick?
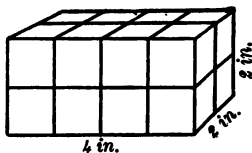
2 times 4 cubic inches = 8 cubic inches.
2 times 8 cubic inches = 16 cubic inches.

10. Build a solid 4 inches long, 4 inches wide, and 4 inches
high; how many cubic inches will it contain? Measure the
distance round it.

11. How many 1-inch cubic blocks can you pack in a
box which is 4 inches long, 4 inches wide, and 4 inches high?

12. How many 1-inch cubes of candy can you place in a
box 6 inches long, 4 inches wide, and 4 inches high, measur-
ing on the inside of the box?

13. Build a solid of one-inch cubes which shall be 12
inches long, 12 inches wide, and 1 inch high; how many
cubes are used?

MISCELLANEOUS PROBLEMS.

239. 1. If 40 men can do a piece of work in 10 days, in
what time could 8 men do the same work?

2. My farm contains 120 acres; $\frac{4}{10}$ of it is in meadow,
$\frac{3}{10}$ in wheat, and the rest in woodland. What part is wood-
land? How many acres are woodland?

3. A stationer bought 12 dozen pens at 5 cents a dozen,
and sold them at two for a cent; what did he gain?

4. I had $120.   I spent $\frac{1}{3}$ of it for a watch, $\frac{1}{4}$ of it for an
overcoat, and $\frac{3}{10}$ of it for board; how much had I left?

5. A man had a dozen boxes of candy, each box containing 10 pounds. If he makes of it packages containing one-half pound each, how many packages will he have?

6. A man carried 4¾ pecks of cherries to market, and sold them at ten cents a quart; how much did he receive for them?

7. At 2 cents a square foot, what will 8 square yards of wire cloth cost?

8. Find the cost of 10 yards of calico at 14 cents a yard, and 8 yards of ribbon at 20 cents a yard.

9. A lady paid ½ of a dollar for a thimble, ⅝ of a dollar for braid, and ₃⁄₁₀ of a dollar for thread; how much money did she spend?

10. James had $100, and spent ½ of it for a watch and ₇⁄₁₀ for a coat; how much money did he have left?

11. If 11 cents is ½ of the cost of a basket, what will 5 baskets cost?

12. If 6 apples cost 5 cents, how many apples can I get for 50 cents?

50 cents is 10 times 5 cents; 10 times 6 apples, or 60 apples, can be bought for 50 cents.

13. What will be the cost of natural gas for 8 months on one cook-stove at $1 a month, two grates at $1.25 each per month, and one base-burner at 90 cents per month?

14. If a boy earns $12 a month, how much will he earn in a year? If he spends ½ of his earnings for clothes and board, how much will he have left?

15. Bought 10 bushels of peaches at $1 a bushel, and sold them at 30 cents a peck; how much was gained?

16. How many quarts of berries, at 12 cents a quart, will it take to pay for 8 yards of cloth, at 16½ cents a yard?

MULTIPLICATION AND DIVISION.

EXERCISE.

240. Find quotients:

1. $133215 \div 107$	11. $444280 \div 232$	21. $766080 \div 315$
2. $347655 \div 215$	12. $519013 \div 319$	22. $660303 \div 423$
3. $809437 \div 621$	13. $923257 \div 862$	23. $735289 \div 599$
4. $217892 \div 493$	14. $707861 \div 639$	24. $603972 \div 224$
5. $1130493 \div 533$	15. $753533 \div 671$	25. $487228 \div 827$
6. $653219 \div 394$	16. $219763 \div 995$	26. $701101 \div 901$
7. $676175 \div 215$	17. $3518599 \div 59$	27. $684938 \div 98$
8. $1603008 \div 198$	18. $4519760 \div 196$	28. $6503188 \div 798$
9. $1529012 \div 189$	19. $5291234 \div 189$	29. $1319229 \div 189$
10. $4805019 \div 789$	20. $8008191 \div 129$	30. $6536479 \div 129$

EXERCISE.

241. Find products:

1. 12486×907	6. 70009×907	11. 67201×1000
2. 63579×786	7. 280963×746	12. 26487×3002
3. 39889×642	8. 247560×985	13. 39865×1008
4. 98270×876	9. 476394×457	14. 90834×9020
5. 62498×805	10. 480976×805	15. 19598×8009

ADDITION AND SUBTRACTION BY ENDINGS.

242.   **9 + 9.**

Read endings; then sums:

9	19	29	39	49	59	69	79	89	99
9	9	9	9	9	9	9	9	9	9

Make a subtraction table by using the results of the above addition and subtracting 9 from each.

Add:

1. 9998, 6799, 8798, 9789, 8989, 9987, 8899, 7899, 7027, 698.
2. 7978, 5887, 7646, 9687, 9596, 6988, 8799, 7996, 7968, 967.

243. Subtract and read endings:

11	43	28	32	54	65	79	87	96	109
9	9	9	9	9	9	9	9	9	9

Subtract:

1. 88764 − 2969	6. 40031 − 9594	11. 10002 − 2999
2. 49875 − 2789	7. 58431 − 3989	12. 68003 − 9095
3. 37953 − 1896	8. 19052 − 9298	13. 90087 − 5069
4. 90585 − 13989	9. 90745 − 11989	14. 19864 − 10989
5. 60103 − 389	10. 70001 − 9867	15. 90003 − 7648

244. Add:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
28	88	38	56	29	28292	13977	44189
92	32	89	69	99	94919	88945	99899
19	99	93	95	92	98189	98288	65288
81	88	38	56	29	28922	33947	76879
28	33	89	69	99	94889	89885	88968
92	89	93	95	92	98328	99689	47399
19	98	38	56	29	28994	33641	89863
81	33	89	69	99	94418	98888	66258
28	89	93	95	92	98999	88697	98898
92	91	38	56	29	28884	33635	75364
19	38	89	69	99	94937	89889	84959
81	99	93	95	92	98488	99398	66895
28	83	38	56	29	28992	33533	78386
92	39	88	69	99	94838	88489	95939
19	83	95	94	95	89985	98982	58897

Subtract:

9.	1000101 − 345879	12.	90148003 − 9876435
10.	80118181 − 698197	13.	67100011 − 400968
11.	864121133 − 36849762	14.	810890890 − 20987689

MISCELLANEOUS PROBLEMS.

245. 1. A hardware store sold wire amounting to $161.46. How many pounds were sold, if wire was worth $.18 a pound?

2. A hotel-keeper paid $52.44 for 38 table-covers. How much was paid for each one?

3. Mr. Irvin spent $17.92 for burlap to cover the walls of his library. How many yards were used, if burlap cost $.29 a yard?

4. Mr. Adam collected $104.49 from a dry-goods house for several bolts of sheeting sold to it. How many yards were bought, if the sheeting was sold at $.27 a yard?

5. In a certain city there are 23,283 school children. How many teachers must be employed to teach them, if each room averages 39 children?

6. The Agricultural Department in Washington bought enough flower seed to fill 476,160 packages. How many pecks of seed were needed, if 96 packages were filled from each peck?

7. Last September a factory received $309.66 from the sale of penholders in Chicago. They were worth $.78 a gross. How many gross were sent there? (A gross is 12 dozen.)

8. A retail store paid $192.78 for 3 bolts of cloth, each containing 54 yards. How much was paid for one yard?

9. The city assessed my property $194.04 for 98 square yards of asphalt on our street. How much was paid for every square yard of asphalt?

10. A man paid $18,144 for a farm of 96 acres. What was the price of each acre?

11. A contractor paid $67.15 for one-inch nails. The nails were worth $.85 per hundred pounds. How many hundred pounds were bought?

12. There are 172 feet of fine wire to a pound. A railroad company used 66,392 feet during the year. How many pounds were used?

13. The Atlas Engine Works spent $1,724.80 on 5½-inch bolts, at $17.60 per hundred. How many hundred bolts were used?

14. The distance from Indianapolis to Chicago is 196 miles. Last year an engineer covered 30,576 miles of ground on his trips to and from Chicago. How often did he cover the distance?

15. At $2.98 a pair, how many pairs of shoes must a dealer sell to receive $551.30?

16. If a young man earns $36 a month, in how many months would he earn $5608?

17. If 43 bu. of corn cost $15.91, what does 1 bu. cost?

18. How many wagon loads of corn containing 41 bu. can be filled from a bin containing 1066 bu.?

19. It is 1392 mi. from here to a certain place. How long will it take to get there, if we travel at the rate of 48 mi. an hour?

20. If 41 men do a piece of work for $69.29 a day, what does one of these men earn?

21. If a bin of wheat is worth $5086.90, how many bushels does it contain, when wheat is selling at $.65 per bu.?

22. How many bushels of wheat worth $.64 are in a bin valued at $469.92?

23. If 69 bu. of corn cost $50.96, what does 1 bu. cost?

24. If it is 2990 mi. from here to San Francisco, how long will it take to get there, traveling at the rate of 46 mi. an hour?

25. A man had $65060; he spent $1905, and purchased land at $65 per A. with the remainder. How many acres did he buy?

26. A farmer having 91 acres of land sold $\frac{4}{7}$ of it for $30940. What did he receive per acre?

27. I sell $\frac{2}{3}$ of my farm of 168 A. for $5796. What is the price per A.?

28. A man sold 86 baskets of grapes for $30.10. For how much did he sell one basket?

29. A surface contains 1431 sq. yd. and is 27 yd. wide; how long is it?

30. How wide is a hall that contains 414 sq. ft. and is 23 ft. long?

31. A floor 13 ft. wide contains 871 sq. ft. How long is it?

32. A surface contains 1677 sq. ft. and is 43 ft. long. How wide is it?

33. I sold 84 barrels of potatoes for $134.40 and lost $12.60. What was the cost per bbl.?

34. The cost of raising potatoes was $159.12. If they are sold in 36 bbl. at a gain of $1.75 per bbl., what is the selling price per bbl.?

35. The cost of 46 bu. of apples is $62.10. They are sold at a gain of $.50 per bu. What is the selling price?

36. I worked 18 weeks at $15.75 a week, and saved $69.30 during the time. How much did I save per week? What were my weekly expenses?

DIVISION.

246. Find quotients:

1.	774648 ÷ 186	9.	614307 ÷ 199
2.	295470 ÷ 190	10.	4722354 ÷ 178
3.	937387 ÷ 184	11.	2966607 ÷ 189
4.	7210473 ÷ 187	12.	713513 ÷ 179
5.	8043840 ÷ 194	13.	2154003 ÷ 399
6.	842877 ÷ 179	14.	1604083 ÷ 987
7.	145260 ÷ 108	15.	685176 ÷ 197
8.	1874774 ÷ 172	16.	1260524 ÷ 159

17.   17820 ÷ 294
18.   632008 ÷ 196
19.   657320 ÷ 178
20.   845679 ÷ 168
21.   2474420 ÷ 307
22. 15604064 ÷ 196
23.   583700 ÷ 395

ADDITION AND SUBTRACTION.
REVIEW.

247. 1. Add: 898, 983, 698, 867, 886, 259, 618, 886, 989, 762 and 479.

2. Add: 464, 399, 987, 999, 878, 466, 598, 694, 726, 899, 668 and 987.

3. $695+944+899+978+627+489+398 + 772 + 786 + 948+499+437+748+454 = ?$

4. $869+254+497+967+669+494+362 + 368 + 349 + 688+547+174 = ?$

(5)	(6)	(7)	(8)	(9)
278	989	868	795	768
985	747	497	867	848
374	298	682	456	494
689	884	376	967	939
567	419	488	678	826
496	568	217	893	677
439	677	168	745	988
797	486	954	878	144
765	819	849	459	899
988	948	756	868	786
642	157	867	787	278
897	764	498	214	527

(10)	(11)	(12)	(13)	(14)
526	987	278	278	2789
788	676	148	879	6187
144	762	126	726	9481
889	829	475	845	8276
496	414	987	794	5769
968	948	276	868	8787
684	687	279	489	9981
845	771	476	596	6688
496	869	278	648	1578
989	494	219	489	4444
878	926	798	964	9276
727	677	694	857	8296

MISCELLANEOUS PROBLEMS.

248. 1. If a man earns $8 a week, in how many weeks will he earn $96?

2. I lost $50 in selling a piano for $280; what was the value of the piano?

3. 8 men together paid $100 for some wheat; if they received equal shares of the wheat, what should each man pay?

4. A lady bought a bushel of sweet potatoes for $2.25, and gave in payment a five-dollar bill; how much change should she receive?

5. Bought 20 yards of carpet for $40, 30 yards of cloth for $75, and 2 pairs of curtains at $16 a pair; what did I pay for all?

6. A real-estate agent bought some land for $2000; how much will he gain, if he divides the land into 4 lots, and sells them for $600 each?

7. If it takes one man 100 days to do a piece of work, in how many days could 2 men do the same work, working at the same rate?

8. If I pay 6 cents for the use of one dollar, what should I pay for the use of 5 dollars, at the same rate? What must I pay for the use of 12 dollars?

9. I borrowed $100 for a year, and paid 6 cents on the dollar for its use; how much did I pay?

10. A car line is 5 miles long; if a car makes 12 round trips daily, how many miles will it run in ten days?

11. In a school of 45 pupils, $\frac{2}{3}$ are present; how many are absent?

12. 5 gallons of cream were sold at 10 cents a pint; how much did it bring?

13. 2 lemons can be bought for 5 cents; at that rate, what is the cost of 2½ dozen?

14. At 30 cents a peck, what will 2½ bushels of apples cost?

15. My lot is 50 feet wide, and four times as long; how many yards of fence will enclose it?

16. What will 2 pounds 4 ounces of tea cost at 80 cents a pound?

17. My slate has a surface of 72 square inches. It is 12 inches long; how wide is it?

18. I have a box 6 inches long, 4 inches wide, and 2 inches deep; how many cubic-inch blocks will it hold?

19. A sheet of paper which is 8 inches wide, has a surface of 96 square inches; find the length.

20. What will a roast of 6 pounds of beef cost, at 12½ cents a pound?

21. The transom above the door is 3 feet long and 2 feet wide; how many panes of glass will it require, if each pane is 1 foot square? (Drawing.)

22. How many cubic inches are there in a block of wood which is 7 inches long, 4 inches wide, and 2 inches thick? (Drawing.) If the block were 3 inches thick, how many cubic inches would it contain? If four inches thick, how many cubic inches?

249. REVIEW.

(1)	(2)	(3)	(4)	(5)
271	274	4278	2789	2718
487	169	8691	2219	476
916	425	9547	6928	8679
629	676	2648	9476	2764
784	918	7927	4629	406
848	215	9687	8742	579
297	776	4948	7887	8719
666	574	8976	6996	2778
779	876	7476	9469	2789
884	217	6216	1754	5476
498	289	7364	4178	4769
867	417	9785	2889	8769

(6)	(7)	(8)	(9)	(10)
7248	722	125	8627	27694
8961	871	672	4578	9678
4476	981	897	9694	5761
9941	494	778	5278	94876
6698	348	444	2419	2765
8269	287	998	6265	47698
4884	666	626	8555	12789
5446	999	269	4278	47687
4998	455	855	3987	2767
9824	844	114	1876	71001
8767	788	748	2947	6843
7287	667	856	3782	9874

Subtract:

11.	80005	14.	103070	17.	90005	20.	307561
	67421		85246		79008		298728

12.	100051	15.	60004	18.	207305	21.	78419
	87643		38965		189649		69593

13.	70005	16.	107302	19.	81012	22.	415007
	38729		56927		69299		387321

DIVISION.

250. Find quotients:

1.	$246573 \div 1212$	9.	$863973 \div 2652$
2.	$745201 \div 2373$	10.	$915761 \div 2483$
3.	$1793257 \div 6253$	11.	$3621487 \div 7193$
4.	$4175959 \div 7329$	12.	$8724165 \div 3998$
5.	$9180257 \div 6351$	13.	$2153897 \div 8253$
6.	$7221483 \div 992$	14.	$11853221 \div 8123$
7.	$1250921 \div 9253$	15.	$5995871 \div 6751$
8.	$27263579 \div 1371$	16.	$42507633 \div 8952$

17. $631253 \div 3251$
18. $2187923 \div 2473$
19. $4267942 \div 8198$
20. $4250963 \div 9876$
21. $793621 \div 9957$
22. $2170821 \div 6125$
23. $84371285 \div 695$
24. $97239643 \div 9853$

MISCELLANEOUS PROBLEMS.

251. 1. How many years is it from the time of the Centennial exhibit at Philadelphia in 1876 to that of the Columbian exhibit at Chicago in 1893?

2. In a field of turnips there are 296 rows, and each row yields 18 bushels; how many loads of 30 bushels each does the field yield?

3. $557283 added to a certain number of dollars will produce $1157003; what is the number?

4. If 68 pounds of coal are consumed in carrying a train one mile, how many pounds will be consumed, at that rate, in going 1894 miles?

5. What time elapsed from the battle of Lexington, 1775, to the firing on Fort Sumter, 1861?

6. If I buy real estate for $854657, agreeing to pay for it in yearly payments of $37159 each, how many payments shall I make?

7. The improved land of the United States is estimated at 207198720 acres; how many townships of 23040 acres each could be made from this land?

8. In a pile of 4701265 bricks, how many loads are there, if each load contains 1000 bricks?

9. $145310 \div 1085 = ?$

10. A miller purchased 2149 bushels of wheat, weighing 128940 pounds; what was the weight of 1 bushel?

11. A road was constructed at a cost of $4328 per mile, and the total cost was $8331400; how many miles long is the road?

12. Find the sum of sixteen million one thousand twenty, twelve million one hundred twenty-eight, nine million

thirteen thousand two, seven million sixteen thousand seven, and three hundred million nine.

13. The President of the United States receives $50,000 a year; how much is that a day?

14. Fairview Park consists of 480 acres, for which $180,-000 was paid; how much was that per acre?

15. If 46 acres of land produce 2,484 bushels of corn, how many bushels will 120 acres produce?

16. There are 30000 voters in a city; counting this as one fourth of the population, what is the population of the city?

17. Lafayette was born in 1757, and entered the American army in 1777; how old was he at that time?

18. How many cubic inches are there in a block of ice 2 feet long, 2 feet wide, and 1 foot thick?

19. The population of Chicago in 1890 was 1,099,850; in 1900 it was 1,698,575. Find the increase for ten years.

CHAPTER VII.

FRACTIONS.

252. What name is given to numbers which represent parts of things, as ½ of a dollar or ¾ of a field?
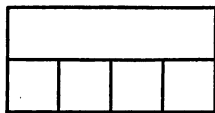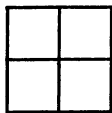
By means of these figures, review the relations of halves, fourths and eighths.

How many halves are there in a whole?
How many fourths in a whole?   In a half?
How many eighths in a whole?   In a half?
In a fourth?
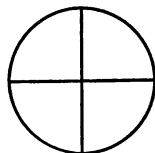
Make other drawings showing halves, thirds, sixths and twelfths, and compare these fractions.

253. ⅝:—What is the name of the parts in this fraction? (Eighths.)

How many eighths have we?   (Six.)

Write the number in such a way as to show that it is a number with a name.   (6 eighths.)

$6; 6 books; 6 quarts:—Give the name, or the denomination, of each of these quantities.

What is the denomination of 6 eighths? . (Eighths.)

The number which shows the name or the *denomination* of a quantity is called the **denominator.**

What is the denominator in ⅜? (Eight.)

Since 6 tells the number of things that we have, we may call it the "numberer" or the **numerator.**

What is the numerator in ⅜?

Give the numerator and the denominator in the following:

8 pencils; 5 dresses; 16 pints; $7; ⅞; ⅔; $\frac{3}{15}$; 4 hours; ⅘; ⅘.

LIKE AND UNLIKE NUMBERS.

254. Numbers which have the same denominator or name are *like.* Numbers which have different denominators or names are *unlike.*

Processes Which may be Performed with Like Numbers.

255. $6 and $2; 6 books and 2 books; 6 quarts and 2 quarts; 6 eighths and 2 eighths:—These quantities may be added, subtracted, divided, or compared by subtraction and division.

1. John's coat cost $6 and his hat $2. How much did both cost?

2. Mrs. Jones received $6 for her weekly expenses. She had $2 left. How much did she expend?

3. At $2 apiece, how many books can be bought with $6?

4. Harry received $6 for a Christmas present. Willie received $2. How much more did Harry get than Willie? How much less did Willie get than Harry?

5. I paid $6 for a hat and $2 for a pair of gloves. The

hat cost how many times as much as the gloves? The cost
of the gloves is what part of the cost of the hat?

NOTE.—Show that the same processes may be performed with
fractions, if they have the same name or denominator. Have
the pupils make problems illustrating all of the fundamental
processes, first with integers and then with fractions.

256. *Unlike numbers* cannot be added, subtracted, di-
vided or compared.

Can these processes be performed with 6 pencils and 2
books?

257. Can you add 6 bushels and 2 pecks?   (Yes.)

What must be done before these quantities can be added?
(They must be changed to the same measure.)

6 bushels = 24 pecks.
24 pecks + 2 pecks = 26 pecks.
24 pecks − 2 pecks = 22 pecks.
24 pecks ÷ 2 pecks = 12.
24 pecks are 22 pecks greater than 2 pecks.
2 pecks are 22 pecks less than 24 pecks.
24 pecks are 12 times 2 pecks.
2 pecks are $\frac{1}{12}$ of 24 pecks.

Can these processes be performed with $\frac{1}{2}$ and $\frac{1}{4}$?   Change
the fractions to the same measure, say fourths.

NOTE.—Teachers should give original problems showing that
fractions not having the same name may be changed to the same
name, and then added, subtracted, divided, or compared.

258. Add, subtract, divide, and compare the follow-
ing fractions by means of the figures on p. 206, pointing
to all fractional parts named:

1	**1**	**1**
1/2	1/3	1/2
1/4	1/6	1/6
1/8	1/12	1/3

1	1 and $\frac{1}{2}$	$\frac{1}{4}$ and $\frac{3}{8}$
	1 and $\frac{1}{4}$	$\frac{1}{4}$ and $\frac{5}{8}$
1/3	$\frac{1}{2}$ and $\frac{1}{4}$	$\frac{1}{4}$ and $\frac{7}{8}$
	$\frac{1}{2}$ and $\frac{3}{4}$	$\frac{3}{4}$ and $\frac{1}{8}$
1/4	1 and $\frac{1}{8}$	$\frac{3}{4}$ and $\frac{3}{8}$
	$\frac{1}{2}$ and $\frac{1}{8}$	$\frac{3}{4}$ and $\frac{7}{8}$
	$\frac{1}{2}$ and $\frac{3}{8}$	1 and $\frac{1}{3}$
1/12	$\frac{1}{2}$ and $\frac{5}{8}$	1 and $\frac{1}{6}$
	$\frac{1}{2}$ and $\frac{7}{8}$	$\frac{1}{3}$ and $\frac{1}{6}$
	$\frac{1}{4}$ and $\frac{1}{8}$	$\frac{1}{3}$ and $\frac{5}{6}$

$\frac{2}{3}$ and $\frac{1}{6}$ $\qquad$ $\frac{2}{3}$ and $1\frac{1}{2}$ $\qquad$ $\frac{1}{4}$ and $\frac{5}{12}$

$\frac{2}{3}$ and $\frac{5}{6}$ $\qquad$ $\frac{1}{6}$ and $\frac{1}{12}$ $\qquad$ $\frac{1}{4}$ and $\frac{7}{12}$

1 and $\frac{1}{12}$ $\qquad$ $\frac{1}{6}$ and $\frac{5}{12}$ $\qquad$ $\frac{1}{4}$ and $1\frac{1}{2}$

$\frac{1}{3}$ and $\frac{1}{12}$ $\qquad$ $\frac{1}{6}$ and $\frac{7}{12}$ $\qquad$ $\frac{3}{4}$ and $\frac{1}{12}$

$\frac{1}{3}$ and $\frac{5}{12}$ $\qquad$ $\frac{1}{6}$ and $1\frac{1}{2}$ $\qquad$ $\frac{3}{4}$ and $\frac{5}{12}$

$\frac{1}{3}$ and $\frac{7}{12}$ $\qquad$ $\frac{5}{6}$ and $\frac{1}{12}$ $\qquad$ $\frac{3}{4}$ and $\frac{7}{12}$

$\frac{1}{3}$ and $1\frac{1}{2}$ $\qquad$ $\frac{5}{6}$ and $\frac{5}{12}$ $\qquad$ $\frac{3}{4}$ and $1\frac{1}{2}$

$\frac{2}{3}$ and $\frac{1}{12}$ $\qquad$ $\frac{5}{6}$ and $\frac{7}{12}$ $\qquad$ $\frac{1}{3}$ and $\frac{1}{4}$

$\frac{2}{3}$ and $\frac{5}{12}$ $\qquad$ $\frac{5}{6}$ and $1\frac{1}{2}$ $\qquad$ $\frac{1}{3}$ and $\frac{3}{4}$

$\frac{2}{3}$ and $\frac{7}{12}$ $\qquad$ $\frac{1}{4}$ and $\frac{1}{12}$ $\qquad$ $\frac{2}{3}$ and $\frac{1}{4}$

REDUCTION.

To Change Integers and Mixed Numbers to Fractions.

259. 1. How many fourths are there in an orange? How many fourths in 6 oranges?

2. How many fifths in a melon? In 3 melons?

In one melon there are five *fifths;* in 3 melons there are three times five *fifths,* or 15 fifths.

3. How many sevenths are there in 4? In 6? In 8?

4. How many eighths of an apple are there in $2\frac{3}{8}$ apples?
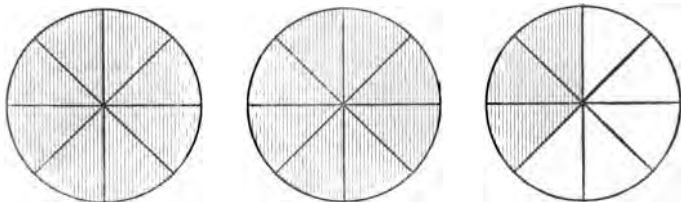
$2\frac{3}{8}$ apples = 2 apples and $\frac{3}{8}$ of an apple. In one apple there are eight eighths. In two apples there are two times eight eighths, which are sixteen eighths. Sixteen eighths and three eighths are nineteen eighths. There are nineteen eighths in $2\frac{3}{8}$ apples.

Change:

5. $3\frac{1}{5}$ oranges to fifths of an orange.

6. $2\frac{3}{4}$ apples to fourths of an apple.

7. $1\frac{5}{8}$ cakes to eighths of a cake.

8. $5\frac{3}{5}$ feet to fifths of a foot.

9. $3\frac{4}{7}$ yards to sevenths of a yard.

10. $3\frac{5}{9}$ gallons to ninths of a gallon.

11. $1\frac{1}{2}$ gallons to fourths of a gallon.

12. $\frac{3}{4}$ quarts to eighths of a quart.

260. A whole number, as distinguished from a fraction, is called an **Integer.**

A **Mixed Number** is an integer and a fraction united; as, $3\frac{1}{4}$, $4\frac{2}{3}$.

An **Improper Fraction** is a fraction whose numerator is as large as, or larger than, its denominator. It is equal to one, or more than one. $\frac{5}{4}$, $\frac{3}{3}$, $\frac{11}{4}$, and $\frac{13}{8}$ are improper fractions.

261. Change to improper fractions:

1. $2\frac{1}{2}$, $3\frac{1}{3}$, $5\frac{2}{5}$, $4\frac{3}{4}$, $4\frac{1}{7}$.
2. $6\frac{2}{3}$, $5\frac{3}{8}$, $7\frac{1}{9}$, $3\frac{2}{8}$, $5\frac{3}{4}$.
3. $3\frac{5}{7}$, $6\frac{3}{8}$, $4\frac{5}{8}$, $3\frac{2}{8}$, $5\frac{5}{8}$.
4. Change to eighths: 3, $2\frac{1}{2}$, $3\frac{1}{4}$, $4\frac{7}{8}$, $2\frac{3}{4}$.
5. Change to twelfths:

     $3\frac{1}{2}$,   2, $2\frac{1}{4}$, $4\frac{1}{3}$, $5\frac{1}{6}$,
     $3\frac{2}{12}$, $3\frac{3}{4}$,   5, $2\frac{2}{3}$, $5\frac{5}{8}$.

6. Change to halves: 7, $4\frac{3}{4}$, $2\frac{3}{8}$, $4\frac{4}{8}$, $3\frac{6}{12}$.

To Change Improper Fractions to Integers or Mixed Numbers.

262. 1. How many pears are there in 12 half-pears? In 13 half-pears?

There are two half-pears in one pear. 2 halves are in 13 halves $6\frac{1}{2}$ times. Therefore, there are $6\frac{1}{2}$ pears in 13 half-pears.

2. How many gallons are there in 6 half-gallons?
3. How many bushels in 17 half-bushels?
4. How many melons in 18 thirds of a melon?
5. How many yards in 17 thirds of a yard?
6. How many ones in 20 fifths? In 28 fourths?

Change to integers or mixed numbers:

7. $\frac{9}{3}$, $\frac{11}{3}$, $\frac{12}{4}$, $\frac{14}{3}$, $\frac{19}{6}$.

8. $\frac{15}{4}$, $\frac{17}{3}$, $\frac{23}{6}$, $\frac{21}{5}$, $\frac{48}{6}$.

9. $\frac{21}{4}$, $\frac{24}{8}$, $\frac{17}{8}$, $\frac{33}{16}$, $\frac{55}{6}$.

10. $\frac{17}{12}$. $\frac{99}{11}$, $\frac{53}{8}$, $\frac{65}{8}$, $\frac{42}{7}$.

To Change Fractions to Higher Terms.

263. To reduce to higher terms is to change a fraction having large-sized parts to a fraction of *equal value* having small-sized parts.

264. 1. How many fourths are there in $\frac{1}{2}$ of a pie?

There are 4 fourths in one pie. In $\frac{1}{2}$ of a pie there are $\frac{1}{2}$ of 4 fourths, which is 2 fourths. $\frac{1}{2}$ of a pie = $\frac{2}{4}$ of a pie.

Reduce:

2. $\frac{1}{2}$ to eighths, $\frac{1}{2}$ to sixths, $\frac{1}{2}$ to twelfths.
3. $\frac{1}{3}$ to sixths, $\frac{2}{3}$ to sixths, $\frac{1}{3}$ to ninths.
4. $\frac{3}{4}$ to twelfths, $\frac{3}{5}$ to fifteenths, $\frac{5}{6}$ to eighteenths.
5. $\frac{1}{2}$ and $\frac{1}{3}$ to sixths.
6. $\frac{2}{3}$ and $\frac{3}{4}$ to twelfths.

265. In changing to higher terms, does the size of the parts increase or decrease?

Is the number of parts increased or decreased?

The form of a fraction may be changed without changing its value, by multiplying both terms by the same number. Thus:

$$\frac{1}{2} = \frac{1 \times 4}{2 \times 4} = \frac{4}{8} \qquad \frac{2}{3} = \frac{2 \times 3}{3 \times 3} = \frac{6}{9}$$

266. 1. Reduce $\frac{1}{3}$, $\frac{1}{6}$, and $\frac{1}{12}$ to equivalent fractions having the same sized parts. (What is the meaning of the word "equivalent"?) By what fractional part can these fractions all be measured?

Determine the common denominator from the drawing.

$$\frac{1}{3} = \frac{?}{12}$$

$$\frac{1}{6} = \frac{?}{12}$$
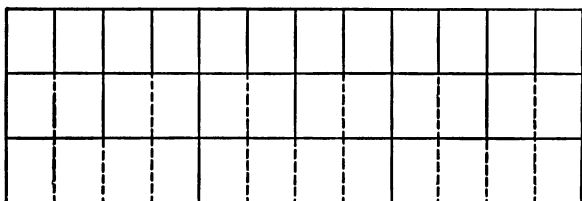
$$\frac{1}{12} = \frac{?}{12}$$

Change to equivalent fractions having a common measure or denominator:

2. $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}$.	7. $\frac{3}{8}$, $\frac{7}{10}$, $\frac{8}{15}$.
3. $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$.	8. $\frac{5}{12}$, $\frac{3}{8}$, $\frac{5}{24}$.
4. $\frac{3}{4}$, $\frac{1}{2}$, $\frac{5}{8}$.	9. $\frac{7}{8}$, $\frac{3}{16}$, $\frac{1}{4}$.
5. $\frac{3}{4}$, $\frac{5}{8}$, $\frac{1}{6}$.	10. $\frac{4}{5}$, $\frac{13}{18}$, $\frac{4}{36}$.
6. $\frac{7}{9}$, $\frac{5}{6}$, $\frac{2}{3}$.	11. $\frac{3}{4}$, $\frac{5}{6}$, $\frac{3}{8}$.

To Change Fractions to Lower Terms.

267. To reduce to lower terms is to change a fraction having small-sized parts to a fraction of *equal value* having large-sized parts.

268. 1. Two quarters of a dollar are the same in value as what single coin?

2. Two quarters of an apple, when placed together, are the same as what part of an apple?

3. Answer the following from the drawings:

1/2				1/3	

1/4						1/4	

$\frac{2}{4} = ?$ $\frac{2}{6} = ?$ $\frac{4}{12} = ?$

$\frac{4}{8} = ?$ $\frac{4}{6} = ?$ $\frac{9}{12} = ?$

$\frac{2}{8} = ?$ $\frac{6}{12} = ?$ $\frac{8}{12} = ?$

$\frac{6}{8} = ?$ $\frac{8}{12} = ?$ $\frac{10}{12} = ?$

$\frac{3}{6} = ?$ $\frac{2}{12} = ?$ $\frac{12}{12} = ?$

1/6

1/3
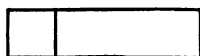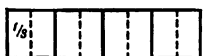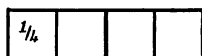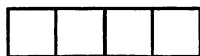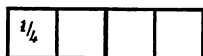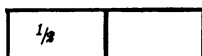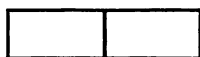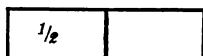
In the answers to the above questions, has the size of the parts been increased or decreased?

Has the number of parts been increased or decreased?

269. *The form of a fraction may be changed without changing its value, by dividing both terms by the same number.* Thus:

$$\frac{2}{4} = \frac{2 \div 2}{4 \div 2} = \frac{1}{2} \qquad \frac{9}{15} = \frac{9 \div 3}{15 \div 3} = \frac{3}{5}$$

270. 1. Reduce $\frac{8}{12}$ and $\frac{4}{16}$ to fourths.

2. Reduce $\frac{6}{21}$, $\frac{9}{21}$, and $\frac{18}{21}$ to sevenths.

3. Reduce $\frac{18}{24}$, $\frac{12}{32}$, and $\frac{8}{16}$, and $\frac{20}{40}$ to eighths.

4. Reduce $\frac{9}{27}$, $\frac{6}{18}$, $\frac{18}{36}$, and $\frac{5}{45}$ to ninths.

271. When a fraction is reduced to an equivalent fraction with smaller terms, it is reduced to *lower terms*.

A fraction is in its *lowest terms* when no number, except **1**, will exactly divide both its numerator and its denominator.

Reduce $\frac{8}{12}$ to lowest terms.

$$\frac{8 \div 2}{12 \div 2} = \frac{4}{6} = \frac{4 \div 2}{6 \div 2} = \frac{2}{3} \text{ or } \frac{8 \div 4}{12 \div 4} = \frac{2}{3}$$

$\frac{2}{3}$ is the fraction in its lowest terms.

272. Reduce to lowest terms:

1. $\frac{4}{12}$, $\frac{6}{12}$, $\frac{4}{8}$, $\frac{9}{12}$, $\frac{8}{12}$.
2. $\frac{12}{18}$, $\frac{6}{18}$, $\frac{9}{18}$, $\frac{6}{16}$, $\frac{12}{18}$.
3. $\frac{12}{24}$, $\frac{15}{30}$, $\frac{12}{36}$, $\frac{18}{30}$, $\frac{9}{24}$.
4. $\frac{30}{38}$, $\frac{25}{40}$, $\frac{24}{36}$, $\frac{24}{36}$, $\frac{30}{40}$.
5. $\frac{32}{64}$, $\frac{36}{48}$, $\frac{25}{40}$, $\frac{18}{27}$, $\frac{21}{35}$.

NOTE.—Pupils should now receive much practice in addition, subtraction, and division of fractions, basing the work on the principle previously developed.

Fractions must be changed to the same measure or denomination before they can be added, subtracted, or divided. Occasionally call for a drawing to illustrate a given problem.

ADDITION OF FRACTIONS.

273. 1. Add $\frac{2}{3}$ and $\frac{3}{4}$.

$$\frac{2 \times 4}{3 \times 4} = \frac{8}{12}$$

$$\frac{3 \times 3}{4 \times 3} = \frac{9}{12}$$

$$\frac{17}{12} = 1\frac{5}{12}.$$

All answers must be changed to their simplest form.

Find the sum of:

2. $\frac{2}{3}$, $\frac{1}{2}$.   5. $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}$.

3. $\frac{3}{4}$, $\frac{5}{8}$.   6. $\frac{1}{2}$, $\frac{4}{5}$.

4. $\frac{1}{2}$, $\frac{3}{4}$, $\frac{1}{8}$.   7. $\frac{1}{2}$, $\frac{3}{4}$, $\frac{4}{8}$.

274. To add mixed numbers, add the integers and the fractions separately and combine the results.

Add $2\frac{3}{4}$, $4\frac{1}{3}$, $3\frac{1}{6}$.

$$2\frac{3}{4} = 2\frac{9}{12}$$
$$4\frac{1}{3} = 4\frac{4}{12}$$
$$3\frac{1}{6} = 3\frac{2}{12}$$
$$\overline{\qquad 9\frac{15}{12} = 10\frac{1}{4}}$$

275. Find the sum of:

1. $4\frac{1}{2}$, $3\frac{2}{3}$, $1\frac{1}{4}$.   4. $4\frac{1}{3}$, $8\frac{3}{4}$, $10\frac{1}{12}$.

2. $9\frac{3}{8}$, $3\frac{1}{2}$, $5\frac{3}{4}$.   5. $15\frac{1}{10}$, $3\frac{4}{5}$, $18\frac{1}{2}$.

3. 8, $5\frac{3}{4}$, $7\frac{1}{2}$.   6. $7\frac{3}{4}$, $5\frac{4}{5}$, $12\frac{5}{12}$.

MENTAL EXERCISE.

276. 1. Mary bought $\frac{5}{8}$ of a yard of ribbon on Tuesday and $\frac{1}{4}$ of a yard on Wednesday.   How much ribbon did she buy all together?

2. Mary gave $\frac{1}{3}$ of her money to her sister, and $\frac{1}{6}$ of it to her brother.   What part of her money did she give away?

3. One lot contains $\frac{5}{8}$ of an acre and another lot $\frac{3}{4}$ of an acre.   How many acres are there in both lots?

4. The difference between two fractions is $\frac{2}{3}$.   One fraction is $\frac{4}{5}$; what is the other?

5. $\frac{5}{8} + \frac{1}{24} + \frac{3}{4} = ?$

6. I needed $2\frac{1}{2}$ feet of wire to hang one Japanese lantern, $3\frac{1}{3}$ feet for another, and $2\frac{4}{15}$ feet for another. How many feet of wire were needed?

7. $3\frac{1}{3} + 5\frac{1}{5} + \frac{1}{15} = ?$

8. $3\frac{1}{4} + 2\frac{7}{8} + 3\frac{1}{2} = ?$

9. $2\frac{5}{8} + 1\frac{1}{3} + \frac{3}{4} = ?$

EXERCISE.

277. 1. By means of drawings, show the sum of $\frac{1}{2}$ and $\frac{3}{4}$.

2. A farm is divided into 3 fields. The first contains $8\frac{1}{2}$ acres, the second $12\frac{3}{4}$ acres, and the third $6\frac{3}{8}$ acres. How many acres does the farm contain?

3. $\frac{4}{5} + \frac{2}{3} + \frac{8}{15} = ?$

4. Find the sum of $2\frac{1}{3}$, $4\frac{3}{8}$, $5\frac{1}{4}$ and $2\frac{7}{12}$.

5. If a tailor uses $3\frac{3}{4}$ yards for a coat, $2\frac{1}{2}$ yards for trousers, and $\frac{7}{8}$ of a yard for a vest, how many yards are used in all?

6. Mrs. Thomas made 4 dresses. For one she used $2\frac{3}{4}$ yards of embroidery; for another, $1\frac{5}{8}$ yards; for another, $4\frac{5}{8}$ yards; for another, $2\frac{5}{8}$ yards. How many yards in all did she use?

7. William walked $3\frac{2}{3}$ miles on Monday, $4\frac{5}{6}$ miles on Tuesday, and $2\frac{5}{8}$ miles on Wednesday. How far did he walk in the three days?

8. $29\frac{1}{2} + 58\frac{5}{8} + 77\frac{1}{16} = ?$

9. Last Saturday Mr. Ray, a coal-dealer, sold $5\frac{1}{4}$ tons, $8\frac{9}{10}$ tons and $6\frac{5}{8}$ tons of coal. How many tons did he sell?

10. $7\frac{1}{2} + 5\frac{1}{2} + 8\frac{9}{10} + 6\frac{3}{8} = ?$

SUBTRACTION OF FRACTIONS.

EXERCISE.

278. 1. Helen had $\frac{5}{6}$ of a yard of ribbon; she gave $\frac{1}{2}$ of a yard to Eleanor; what part of a yard had she left?

$$\frac{5 \times 1}{6 \times 1} = \frac{5}{6}$$
$$\frac{1 \times 3}{2 \times 3} = \frac{3}{6}$$
$$\frac{2}{6} = \frac{1}{3}.$$

She had $\frac{1}{3}$ of a yard left.

Subtract:

2. $\frac{2}{3} - \frac{1}{2} = ?$	6. $\frac{4}{7} - \frac{2}{3} = ?$	10. $1\frac{1}{4} - \frac{2}{7} = ?$
3. $\frac{5}{6} - \frac{1}{3} = ?$	7. $\frac{7}{10} - \frac{1}{5} = ?$	11. $\frac{4}{5} - \frac{2}{8} = ?$
4. $\frac{3}{8} - \frac{2}{4} = ?$	8. $\frac{7}{8} - \frac{4}{7} = ?$	12. $1\frac{1}{3} - \frac{5}{8} = ?$
5. $1\frac{1}{12} - \frac{1}{6} = ?$	9. $1\frac{8}{21} - \frac{4}{7} = ?$	13. $\frac{8}{9} - \frac{5}{8} = ?$

EXERCISE.

279. 1. Mr. Smith earns $15 a week and spends 7\frac{3}{4}$ a week. How much does he save in one week?

$$\$15 = \$14\frac{4}{4}$$
$$\$7\frac{3}{4}$$
$$\overline{\$7\frac{1}{4}}$$

He has left 7\frac{1}{4}$.

Subtract:

2. $4 - 2\frac{5}{7} = ?$	5. $89 - 49\frac{4}{12} = ?$
3. $15 - 4\frac{3}{8} = ?$	6. $57 - 18\frac{5}{12} = ?$
4. $8 - 3\frac{2}{8} = ?$	7. $52 - 27\frac{4}{8} = ?$

280. 1. Mary had $4\frac{1}{2}$ apples and gave $1\frac{3}{4}$ apples to her brother. How many did she have left?

$$4\frac{1\times2}{2\times2}=4\frac{2}{4}=3\frac{6}{4}$$
$$1\frac{3\times1}{4\times1}=1\frac{3}{4}=1\frac{3}{4}$$
$$2\frac{3}{4}$$

3 fourths of an apple from 2 fourths of an apple cannot be taken. Take 1 apple from the 4 apples, which leaves 3 apples. This one apple equals 4 fourths of an apple. 4 fourths of an apple and 2 fourths of an apple are equal to 6 fourths of an apple. 3 fourths from 6 fourths leave 3 fourths. One apple from 3 apples leaves 2 apples. Mary has left $2\frac{3}{4}$ apples.

Subtract:

2. $4\frac{2}{3}-2\frac{1}{2}=?$	6. $4\frac{1}{3}-2\frac{1}{2}=?$	10. $5\frac{1}{6}-2\frac{2}{3}=?$
3. $8\frac{1}{5}-3\frac{1}{3}=?$	7. $6\frac{1}{4}-2\frac{2}{3}=?$	11. $15\frac{3}{8}-10\frac{1}{10}=?$
4. $4\frac{7}{10}-1\frac{1}{8}=?$	8. $5\frac{2}{3}-1\frac{3}{4}=?$	12. $10\frac{1}{12}-3\frac{1}{3}=?$
5. $10\frac{7}{8}-2\frac{4}{7}=?$	9. $6\frac{1}{10}-2\frac{5}{6}=?$	13. $24\frac{1}{6}-18\frac{1}{2}=?$

14. $10\frac{1}{9}-8\frac{1}{8}=?$

15. $14\frac{4}{7}-9\frac{2}{3}=?$

16. $25\frac{18}{21}-16\frac{4}{7}=?$

281. 1. I bought groceries amounting to $\frac{2}{8}$ of a dollar. How much change did I receive if I gave the grocer $\frac{1}{2}$ of a dollar?

2. I pay $\frac{1}{10}$ of a dollar for a book and sell it for $\frac{1}{8}$ of a dollar.   How much do I lose?

3. $\frac{3}{4} - \frac{3}{8} = ?$

4. $\frac{2}{3} - \frac{1}{6} = ?$

5. $\frac{7}{8} - \frac{2}{4} = ?$

6. Mary had $3\frac{1}{2}$ and spent $1\frac{1}{4}$. How much had she left?

7. The sum of two numbers is $5\frac{1}{2}$. One number is $2\frac{5}{8}$; what is the other?

8. $\frac{7}{8} - \frac{3}{4} = ?$

9. Mrs. Bush bought 12 pounds of sugar. She used $6\frac{1}{2}$ pounds in making jelly. How many pounds has she left?

10. My mother gave me a ten-dollar bill for my birthday present. I spent $6\frac{3}{4}$ for a hat. How much had I left?

EXERCISE.

282. 1. Mrs. Jones owned $3\frac{1}{2}$ lots near our school-house. She sold $1\frac{1}{4}$ lots for $2,200. How many lots has she left?

2. A piece of cloth contains $18\frac{1}{4}$ yards. How many yards will be left after $13\frac{5}{8}$ yards are used?

3. Find the difference between $12\frac{1}{2}$ and $23\frac{1}{3}$.

4. I spent $21\frac{1}{2}$ for a table and a chair. The chair cost me $12\frac{3}{4}$. Find the cost of the table.

5. A man bought a horse for $50, and sold it for $45\frac{3}{4}$. Find the amount of loss.

6. I owe $6\frac{2}{3}$. If I pay $\frac{3}{4}$ of a dollar, how much shall I then owe?

7. If from $8\frac{1}{4}$ there be taken $6\frac{2}{3}$, how much will remain?

8. A table which cost Mr. Howe $6.75 was sold for $7\frac{1}{2}$. What was the gain?

9. What fraction added to $\frac{3}{8}$ will make $\frac{11}{12}$?

283. 1. A tailor bought $8\frac{1}{4}$ yards of cloth. He sold $3\frac{1}{4}$ yards for a coat, $\frac{7}{8}$ of a yard for a vest and $2\frac{3}{8}$ yards for trousers. How many yards had he left?

2. A lady bought a pair of gloves for $\$1\frac{3}{4}$, a hat for $\$7\frac{1}{2}$, and some lace for $\$1\frac{1}{4}$. She gave the clerk a twenty-dollar gold piece. How much change should she receive?

3. A coal-dealer bought $25\frac{1}{2}$ tons of coal. He sold $4\frac{1}{2}$ tons, $5\frac{3}{4}$ tons, $6\frac{3}{8}$ tons and $3\frac{1}{2}$ tons. How many tons had he left?

4. A man bought wood for $\$6\frac{3}{4}$, hay for $\$9\frac{3}{8}$ and feed for $\$7\frac{1}{2}$; how much did all cost?

5. James had a distance of 85 miles to ride. He rode $31\frac{3}{8}$ miles on the first day and $24\frac{3}{4}$ miles on the second day. How many miles has he still to travel?

6. From $\$23\frac{3}{4}$ take the difference between $\$8\frac{1}{2}$ and $\$10\frac{3}{4}$.

7. A grocer cleared $\$10$ last Friday; $\$1\frac{3}{4}$ was cleared on vegetables; $\$2\frac{1}{2}$ on fruits; $\$3\frac{3}{8}$ on flour; the remainder was made on small articles. How much did he clear on small articles?

8. From the sum of $10\frac{7}{8}$ and $8\frac{1}{4}$ take their difference.

9. Take the difference between $3\frac{3}{4}$ and $8\frac{1}{2}$ from $10\frac{1}{4}$.

10. From the sum of $6\frac{1}{2}$ and $3\frac{5}{8}$ take their difference.

11. A man divided his property among his five children, giving $\frac{1}{3}$ of it to the first, $\frac{1}{5}$ to the second, $\frac{1}{4}$ to the third, and $\frac{1}{12}$ to the fourth; what part did the fifth child receive?

12. $\frac{2}{3}$ of my library is history, $\frac{3}{12}$ poetry, $\frac{1}{4}$ science, and the remainder fiction; what part is fiction?

13. A man did $\frac{1}{3}$ of his work the first day, $\frac{1}{4}$ of it the second day, and $\frac{1}{6}$ of it the third day. What part was left to do on the fourth day?

DIVISION OF FRACTIONS.

Division by a Fraction.

EXERCISE.

284. 1. To how many children can I give $\frac{1}{4}$ of an apple, if I have $\frac{1}{2}$ of an apple?

I can give to as many children as $\frac{1}{4}$ of an apple is contained times in $\frac{1}{2}$ of an apple.

$\frac{1}{2}$ of an apple = $\frac{2}{4}$ of an apple.
$\frac{2}{4}$ of an apple ÷ $\frac{1}{4}$ of an apple = 2.

I can give $\frac{1}{4}$ of an apple to each of 2 children.

In the following problems, reduce the fractions to the same denominator and then divide the numerators.

2. $\frac{1}{2} \div \frac{1}{8} = ?$	7. $\frac{3}{4} \div \frac{5}{8} = ?$	12. $\frac{2}{3} \div \frac{1}{4} = ?$
3. $\frac{1}{2} \div \frac{3}{8} = ?$	8. $\frac{1}{4} \div \frac{3}{8} = ?$	13. $\frac{3}{4} \div \frac{3}{2} = ?$
4. $\frac{1}{4} \div \frac{1}{8} = ?$	9. $\frac{1}{2} \div \frac{3}{4} = ?$	14. $\frac{3}{4} \div \frac{2}{3} = ?$
5. $\frac{3}{4} \div \frac{1}{8} = ?$	10. $\frac{5}{8} \div \frac{3}{4} = ?$	15. $\frac{1}{4} \div \frac{5}{8} = ?$
6. $\frac{3}{4} \div \frac{3}{8} = ?$	11. $\frac{1}{3} \div \frac{1}{4} = ?$	16. $\frac{3}{4} \div \frac{1}{6} = ?$

EXERCISE.

285. 1. A man has 2 acres which he wishes to divide into lots of $\frac{1}{2}$ of an acre each. How many lots will he have?

He will have as many lots as $\frac{1}{2}$ of an acre is contained times in 2 acres.

2 acres = $\frac{4}{2}$ acres.
$\frac{4}{2}$ acres ÷ $\frac{1}{2}$ of an acre = 4.

He will have 4 lots.

2. $\$3 \div \$\frac{1}{2} = ?$ 5. 2 oz. $\div \frac{3}{4}$ oz. = ?

3. 2 bu. $\div \frac{1}{4}$ bu. = ?   6. 10 lb. $\div \frac{2}{8}$ lb. = ?

4. 3 qt. $\div \frac{3}{4}$ qt. = ?   7. 5 apples $\div \frac{5}{8}$ of an apple = ?

8. 8 pt. $\div \frac{2}{3}$ pt. = ?

9. 6 acres $\div \frac{3}{4}$ acres = ?

10. 9 in. $\div \frac{3}{4}$ in. = ?

EXERCISE.

286. 1. A woman bought $2\frac{2}{3}$ pounds of candy to give to her nephews. She placed it in bags each holding $\frac{1}{6}$ of a pound. Into how many bags did she put the candy?

$2\frac{2}{3}$ pounds = $\frac{8}{3}$ pounds = $\frac{16}{6}$ pounds.

$\frac{16}{6}$ pounds $\div \frac{1}{6}$ pounds = 16.

She put the candy into 16 bags.

2. $\$3\frac{1}{2} \div \$\frac{1}{2} = ?$ 6. $\$3\frac{3}{5} \div \$\frac{9}{10} = ?$ 10. $\$2\frac{1}{2} \div \$\frac{1}{3} = ?$

3. $2\frac{3}{4} \div \frac{1}{4} = ?$ 7. $2\frac{3}{4} \div \frac{3}{8} = ?$ 11. $2\frac{2}{5} \div \frac{3}{8} = ?$

4. $3\frac{3}{4} \div \frac{3}{4} = ?$ 8. $5\frac{1}{3} \div \frac{1}{3} = ?$ 12. $4\frac{1}{2} \div \frac{2}{8} = ?$

5. $2\frac{1}{2} \div \frac{1}{4} = ?$ 9. $5\frac{1}{3} \div \frac{5}{6} = ?$ 13. $2\frac{3}{4} \div \frac{2}{3} = ?$

Division by a Whole Number.

EXERCISE.

287. 1. At $2 a yard, how much velvet can be bought with 1\frac{1}{2}$?

$\$1\frac{1}{2} = \$\frac{3}{2}$. $\$2 = \$\frac{4}{2}$.

$\$\frac{3}{2} \div \$\frac{4}{2} = \frac{3}{4}$.

You can get $\frac{3}{4}$ of a yard.

2. $4\frac{1}{2}$ bu. $\div 2$ bu. $= ?$ 6. $2\frac{1}{4}$ in. $\div 3$ in. $= ?$

3. $5\frac{3}{4}$ pt. $\div 3$ pt. $= ?$ 7. $1\frac{1}{4}$ ft. $\div 5$ ft. $= ?$

4. $\$2\frac{1}{2} \div \$3 = ?$ 8. $7\frac{1}{2}$ bbl. $\div 3$ lb. $= ?$

5. $\$2\frac{5}{8} \div \$2 = ?$ 9. $5\frac{5}{8}$ lb. $\div 7$ lb. $= ?$

EXERCISE.

288. 1. At \$3 a barrel, how many barrels of apples can be bought for $\frac{3}{4}$ of a dollar?

$$\$3 = _4. \quad \$\frac{3}{4} \div \$\frac{12}{4} = \frac{3}{12} = \frac{1}{4}.$$

At \$3 a barrel, $\frac{1}{4}$ of a barrel can be bought for $\$\frac{3}{4}$.

2: At \$2 a pound, what part of a pound of writing paper can be bought with $\$\frac{1}{4}$?

$$\$2 = \$\frac{8}{4}.$$
$$\$\frac{1}{4} \div \$\frac{8}{4} = \frac{1}{8}.$$

You can buy $\frac{1}{8}$ of a pound.

3. $\$\frac{1}{2} \div \$2 = ?$ 6. $\frac{5}{8} \div 5 = ?$ 9. $\frac{4}{7} \div 2 = ?$

4. $\frac{1}{4} \div 4 = ?$ 7. $\frac{3}{8} \div 3 = ?$ 10. $\frac{5}{8} \div 5 = ?$

5. $\frac{2}{3} \div 4 = ?$ 8. $\frac{4}{8} \div 2 = ?$ 11. $\frac{9}{10} \div 3 = ?$

Division by a Mixed Number.

289. 1. At $\$3\frac{1}{5}$ a bushel, what part of a bushel of cranberries can be bought for \$2?

$$\$2 = \$\frac{10}{5}. \qquad \$3\frac{1}{5} = \$\frac{16}{5}.$$
$$\$\frac{10}{5} \div \$\frac{16}{5} = \frac{10}{16} = \frac{5}{8}.$$

You can buy $\frac{5}{8}$ of a bushel.

2. I can save \$1⅛ from my weekly earnings.   How long
will it take me to save \$3⅜?

$$\$3\tfrac{3}{8} = \$\tfrac{18}{5}. \qquad \$1\tfrac{1}{8} = \$\tfrac{6}{5}.$$
$$\$\tfrac{18}{5} \div \$\tfrac{6}{5} = 3.$$

It will take me 3 weeks.

3. At \$1⅔ a gallon, what part of a gallon of cream can be
bought with \$⅔?

$$\$\tfrac{2}{3} = \$\tfrac{10}{15}. \qquad \$1\tfrac{2}{3} = \$\tfrac{8}{5} = \$\tfrac{24}{15}.$$
$$\$\tfrac{10}{15} \div \$\tfrac{24}{15} = \tfrac{10}{24} = \tfrac{5}{12}.$$

You can get $\tfrac{5}{12}$ of a gallon.

290.   EXERCISE.

1. 3 yd. ÷2½ yd. = ?   6. \$2⅔ ÷\$3½ = ?
2. 5 ft. ÷6⅔ ft. = ?   7. 3¼ lb. ÷2¼ lb. = ?
3. \$3 ÷\$5¼ = ?   8. ⅔ pt. ÷5⅓ pt. = ?
4. \$1½ ÷\$4½ = ?   9. ⅝ ÷2½ = ?
5. 9½ bu. ÷2¼ bu. = ?   10. ¾ ÷1⅔ = ?

            11. 6 oz. ÷2⅔ oz. = ?
            12. 4⅔ ÷1⅛ = ?
            13. ¾ ÷3½ = ?
            14. 3⅛ ÷6¼ = ?
            15. 3¾ ÷2⅞ = ?

MENTAL EXERCISE.

291. 1. ⅝ ÷⅚ = ?

2. ⅔ ÷⅞ = ?

3. How many pounds of butter can be bought with ¾ of a
dollar, if one pound costs ⅛ of a dollar?

4. How many badges, each $\tfrac{1}{16}$ of a yard long, can be cut
from ⅞ of a yard of ribbon?

5. How many dozen oranges, at $\frac{3}{8}$ of a dollar a dozen, can I buy with \$2?

6. $\frac{3}{4} \div \frac{5}{8} = ?$

7. John earns $\frac{1}{2}$ of a dollar a day. How many days will it take him to earn \$8?

8. How many pounds of coffee, at $\frac{1}{4}$ of a dollar pound, can be obtained with \$6?

9. One basket of peaches holds $\frac{5}{8}$ of a bushel. How many baskets will hold 4 bushels?

10. How many tables can be covered with 5 yards of cloth, allowing $\frac{5}{8}$ of a yard for each table?

11. How many times may $\frac{3}{7}$ be subtracted from 3?

12. Among how many families can you divide $4\frac{4}{5}$ tons of coal, if each family receives $\frac{1}{5}$ of a ton?

13. At $\frac{1}{3}$ of a dollar a pound, how many pounds of butter can be bought with \$2$\frac{1}{6}$?

14. $5\frac{1}{3} \div \frac{2}{3} = ?$

15. How many books can be covered with $2\frac{2}{3}$ yards of canvas, if you allow $\frac{4}{5}$ of a yard for each book?

16. $1\frac{1}{2} \div \frac{3}{8} = ?$

17. A man divided \$2$\frac{4}{5}$ among his children, giving each child $\frac{7}{10}$ of a dollar. How many children had he?

18. I have \$1$\frac{1}{2}$ with which to buy ribbon, at $\frac{3}{8}$ of a dollar a yard. How many yards can I buy?

19. $1\frac{4}{5} \div \frac{1}{3} = ?$

20. What part of a barrel holding 4 bushels can be filled with $1\frac{1}{2}$ bushels?

21. $2\frac{1}{2} \div 2 = ?$

22. It takes 2 bushels of wheat to sow a field. What part of the field can be sown with $\frac{3}{4}$ of a bushel?

23. $\frac{2}{5} \div 6 = ?$

24. $1\frac{1}{2} \div 4\frac{1}{2} = ?$
25. $2\frac{2}{3} \div 3\frac{1}{2} = ?$
26. $2\frac{3}{4} \div 1\frac{1}{3} = ?$

EXERCISE.

292. 1. To how many families does a grocer sell 6 bushels of apples, if each family buys $\frac{3}{4}$ of a bushel?

2. When sugar is $5\frac{1}{2}$ cents a pound, how many pounds can be bought with $66?

3. $13\frac{2}{3} \div 5\frac{1}{8} = ?$

4. John earns $1\frac{1}{8}$ a day. How long will it take him to earn $1\frac{1}{2}$?

5. How many vests, each containing $1\frac{3}{4}$ yards, can be cut from $10\frac{1}{2}$ yards of cloth?

6. $1\frac{1}{8} \div 5\frac{1}{4} = ?$

7. Anthracite is worth $7\frac{1}{2} a ton; $31\frac{1}{2} will buy how many tons?

8. $46 \div 11\frac{1}{2} = ?$

9. A merchant spent $13\frac{1}{2} for apples at $\frac{3}{4}$ of a dollar a bushel. How many bushels did he get?

10. When flour is $7\frac{3}{4} a barrel, how many barrels can be bought with $62?

11. A farmer received $175 for rye at $\frac{7}{8}$ of a dollar a bushel. How many bushels did he sell?

12. How many steps must be taken in walking a mile, or 5280 feet, if each step is $2\frac{1}{2}$ feet long?

13. A piece of cloth is $45\frac{1}{2}$ yards long. How many pieces, each containing $1\frac{5}{8}$ yards, can be cut from it?

14. At $.08\frac{1}{3} a quart, how many gallons of strawberries can be bought with $2\frac{1}{2}$?

293. 1. A boy earns $5⅝ one month and $4¾ the next month. How many chairs, at $1¼ apiece, could he buy for his mother with the money?

2. Add together 3⅝ and 2$\frac{5}{12}$ and divide the sum by ¾.

3. Mary had 7¼ yards of gingham and bought 8½ yards more. How many aprons can she cut from both pieces, if each apron requires 2¼ yards?

4. A man bought 12½ acres of land at one time, and 13¾ acres adjoining, at another time. Into how many lots of 1⅞ acres each could he divide his land?

5. Jane spent the difference between $9 and $5½ for a hat. How many such hats could be bought with $14?

6. Mr. Harold raised 50 bushels of wheat. He sold 7½ bushels and placed the remainder into bags, each holding 2½ bushels. How many bags were necessary?

7. A grocer has 36½ pounds of flour in 1 barrel and 38$\frac{6}{12}$ pounds in another. He decides to pack it in sacks each holding 12½ pounds. How many sacks will be necessary?

8. A farmer had $86. He paid a bill amounting to $24½, and with the remainder bought sugar at $\frac{4}{16}$ of a dollar a pound. How many pounds did he receive?

9. A skilled carpenter earned 49\frac{6}{12}$ at one time and $25½ at another. How many days did he work, if he received $3 per day?

10. A furniture dealer had $170⅝ and spent 40\frac{8}{16}$ for bedsteads. How many chairs, at $1⅛ a piece, can he buy with the remainder?

11. I wished to buy cloth for a dress, at $3¼ a yard. My mother gave me $7¾ and my brother, $8½. How many yards could I buy with my money?

MULTIPLICATION OF FRACTIONS.
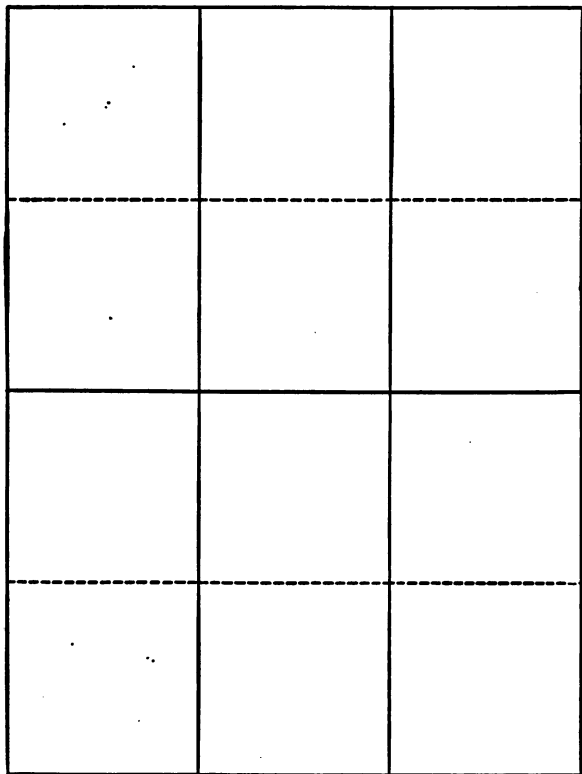
294. 1. How many inch squares are there in this figure?

2. In $\frac{1}{2}$ of it?　　4. In $\frac{2}{3}$ of it?　　6. In $\frac{3}{4}$ of it?

3. In $\frac{1}{3}$ of it?　　5. In $\frac{1}{4}$ of it?　　7. In $\frac{1}{6}$ of it?

8. In $\frac{5}{6}$ of it?　　9. $\frac{1}{2}$ of $\frac{1}{2}$ is what part of the whole?

10. $\frac{1}{2}$ of $\frac{1}{3}$ is what part of the whole?

11. $\frac{1}{2}$ of $\frac{1}{3}=$?   14. $\frac{1}{3}$ of $\frac{1}{4}=$?   17. $\frac{3}{4}$ of $\frac{2}{3}=$?

12. $\frac{1}{2}$ of $\frac{1}{6}=$?   15. $\frac{2}{3}$ of $\frac{1}{2}=$?   18. $\frac{5}{6}$ of $\frac{1}{2}=$?

13. $\frac{1}{3}$ of $\frac{1}{2}=$?   16. $\frac{1}{4}$ of $\frac{2}{3}=$?   19. $\frac{1}{8}$ of $\frac{1}{3}=$?

EXERCISE.

295. 1. Mary divided $\frac{3}{4}$ of a yard of ribbon equally among 3 girls; what part of a yard did each girl receive?

Each girl received $\frac{1}{3}$ of $\frac{3}{4}$ of a yard. $\frac{1}{3}$ of $\frac{3}{4}$ of yard$=\frac{1}{4}$ of a yard.

2. If a man mows $\frac{2}{3}$ of an acre in a day, how much does he mow in $\frac{1}{2}$ of a day?

3. What is the cost of $\frac{7}{8}$ of a yard of flannel, at $\frac{1}{2}$ of a dollar a yard?

4. If silk is worth $\frac{4}{5}$ of a dollar a yard, what is $\frac{5}{8}$ of a yard worth?

5. If a knife is worth $\frac{9}{10}$ of a dollar, and a slate $\frac{5}{8}$ as much, what is the slate worth?

6. At $\frac{5}{8}$ of a dollar a pound, what is $\frac{4}{15}$ of a pound of tea worth?

7. $\frac{2}{3}$ of $\frac{3}{10}=$?

8. What is the cost of $\frac{3}{4}$ of a gallon of milk, at \$.20 a gallon?

9. A man's field contained 90 acres of land. He planted $\frac{5}{8}$ of it in corn. How many acres of corn had he?

10. The cost of my dress is $\frac{2}{3}$ of \$7$\frac{1}{2}$. Find the cost of the dress.

11. A tailor used $5\frac{5}{8}$ yards of cloth for a suit; $\frac{3}{8}$ of this was used for the coat. How many yards of cloth were used for the coat?

12. Four spellers are worth \$.60. What part of this are 3 spellers worth? How much money?

13. Find the cost of 12 pencils, if 10 pencils are worth $0.25.

14. 2½ barrels of apples are worth $10.   Find the cost of 1 barrel.

$2\frac{1}{2}$ barrels = $\frac{5}{2}$ barrels. We wish to find the cost of $\frac{2}{2}$ of a barrel.

$$5\,)\,\$10 = \text{cost of } \tfrac{5}{2} \text{ barrels.}$$
$$\$2 = \text{cost of } \tfrac{1}{2} \text{ of a barrel.}$$
$$\underline{2}$$
$$\$4 = \text{cost of 1 barrel.}$$

Or better:

$\frac{2}{2}$ of a barrel = $\frac{2}{5}$ of $\frac{5}{2}$ barrels.

$\frac{2}{5}$ of $\$\overset{2}{\cancel{10}}\!\!\! = \$4$.

One barrel will cost $4.

Dividing 5 into 10, as shown above, is called *cancellation.*   It should be used whenever possible.

15. What is the cost of 1 yard of cloth, if 4½ yards are worth $9?

16. Mr. Smith paid $16 for 2⅘ tons of anthracite.   How much was it per ton?

17. What must a dealer pay for 1 bushel of cranberries, if 3⅓ bushels are worth $6.10?

18. I live 10 blocks from the church.   This is 2½ times my distance to school.   How far am I from school?

19. 3½ baskets of peaches were sold for $4⅙.   What was the selling price per basket?

20. I paid ⅝ of a dollar for 2½ pounds of candy.   How much was it per pound?

21. A man bequeathed $7500 to his son.   This was 3¾ times as much as he gave to his daughter.   Find the daughter's share.

22. $25\frac{7}{8} \div 4\frac{1}{2} = ?$

23. $57\frac{1}{4} \div 13\frac{1}{3} = ?$

296. From the drawing answer the following, express-
ing the answers in the
simplest form:
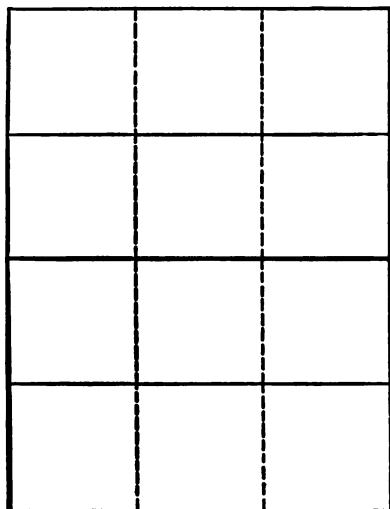
1. 2 times $\frac{1}{2}$ = ?
2. 2 times $\frac{1}{4}$ = ?
3. 3 times $\frac{1}{4}$ = ?
4. 4 times $\frac{1}{4}$ = ?
5. 2 times $\frac{3}{4}$ = ?
6. 2 times $\frac{1}{3}$ = ?
7. 2 times $\frac{2}{3}$ = ?
8. 2 times $\frac{1}{6}$ = ?
9. 2 times $\frac{2}{6}$ = ?
10. 3 times $\frac{1}{12}$ = ?
11. 4 times $\frac{1}{12}$ = ?
12. 6 times $\frac{1}{12}$ = ?
13. 8 times $\frac{1}{12}$ = ?

14. $\frac{1}{12} \times 10$ = ?   17. $\frac{4}{12} \times 2$ = ?   20. $\frac{3}{12} \times 3$ = ?

15. $\frac{2}{12} \times 2$ = ?   18. $\frac{3}{12} \times 4$ = ?   21. $\frac{4}{12} \times 3$ = ?

16. $\frac{3}{12} \times 2$ = ?   19. $\frac{2}{12} \times 3$ = ?   22. $\frac{6}{12} \times 2$ = ?

**Multiplication of a Fraction by an Integer or a Mixed
Number.**

EXERCISE.

297. 1. If a yard of cloth costs $\frac{2}{3}$ of a dollar, what will 3
yards cost?

$$\$\tfrac{2}{3} \times 3 = \$\tfrac{6}{3} = \$2.$$

Three yards cost $2.

2. At $\frac{1}{6}$ of a dollar a yard, how much must be paid for $1\frac{1}{3}$ yards of ribbon?

$1\frac{1}{3}$ **yards** $= \frac{4}{3}$ **yards.**
$\frac{4}{3}$ **of** $\frac{1}{6}$ **of a dollar** $= \frac{2}{9}$ **of a dollar.**

$1\frac{1}{3}$ **yards cost** $\frac{2}{9}$ **of a dollar.**

3. $\frac{2}{3} \times 5 = ?$	7. $\frac{3}{8} \times 6 = ?$	11. $5\frac{1}{4} \times \frac{2}{7} = ?$
4. $\frac{3}{4} \times 6 = ?$	8. $1\frac{1}{6} \times \frac{2}{7} = ?$	12. $5\frac{1}{3} \times \frac{5}{8} = ?$
5. $\frac{7}{8} \times 4 = ?$	9. $5\frac{1}{3} \times \frac{3}{8} = ?$	13. $4\frac{2}{3} \times \frac{5}{8} = ?$
6. $\frac{1}{3} \times 9 = ?$	10. $1\frac{1}{2} \times 16 = ?$	14. $\frac{3}{8} \times 15 = ?$

Make, in class, concrete problems from the above examples.

Multiplication of Integers and Mixed Numbers.

EXERCISE.

298. 1. What will 3 bushels of oranges cost, at $5\frac{1}{3}$ a bushel?

$\$5\frac{1}{3} = \$\frac{16}{3}.$ $\$\frac{16}{3} \times 3 = \$16.$

3 bushels of oranges will cost $16.

Multiply:

2. $5\frac{1}{4} \times 8.$	6. $16 \times 1\frac{3}{12}.$	10. $9 \times 3\frac{2}{6}.$
3. $2\frac{1}{10} \times 5.$	7. $1\frac{1}{14} \times 7.$	11. $3\frac{1}{8} \times 4.$
4. $4\frac{1}{6} \times 6.$	8. $10 \times 5\frac{1}{2}.$	12. $5 \times 7\frac{1}{6}.$
5. $12 \times 3\frac{1}{8}.$	9. $2\frac{1}{2} \times 16.$	13. $4\frac{1}{8} \times 8.$

Multiplication of a Mixed Number by a Mixed Number.

299. 1. What must be paid for $1\frac{1}{4}$ pecks of English walnuts, at $1\frac{1}{5}$ a peck?

$$1\frac{1}{4} \text{ pecks} = \frac{5}{4} \text{ pecks.}$$
$$\$1\frac{1}{5} = \$\frac{6}{5}.$$
$$\frac{5}{4} \times \$\frac{\overset{3}{\cancel{6}}}{\underset{2}{\cancel{5}}} = \$\frac{3}{2} = \$1\frac{1}{2}.$$

$1\frac{1}{4}$ pecks of English walnuts cost $1\frac{1}{2}$.

Multiply:

2. $1\frac{5}{6}$ by $1\frac{1}{3}$.	6. $5\frac{1}{3}$ by $3\frac{3}{4}$.	10. $2\frac{3}{8}$ by $5\frac{1}{3}$.
3. $3\frac{3}{4}$ by $1\frac{1}{3}$.	7. $3\frac{5}{8}$ by $2\frac{2}{3}$.	11. $7\frac{1}{2}$ by $3\frac{3}{4}$.
4. $1\frac{1}{6}$ by $1\frac{5}{7}$.	8. $2\frac{1}{7}$ by $5\frac{1}{4}$.	12. $1\frac{1}{4}$ by $1\frac{7}{8}$.
5. $1\frac{2}{3}$ by $1\frac{1}{3}$.	9. $1\frac{11}{12}$ by $4\frac{4}{7}$.	13. $6\frac{1}{4}$ by $4\frac{3}{8}$.

300. 1. A boy walked $2\frac{2}{3}$ miles in 1 hour. How far can he walk, at that rate, in 10 hours?

2. Find the value of 12 bushels of corn, at $\frac{3}{8}$ of a dollar a bushel.

3. At $.06\frac{1}{4}$ a yard, what will $7\frac{1}{2}$ yards of braid cost?

4. A boy is able to read $5\frac{1}{4}$ pages of his book in an hour. How much can he read in $1\frac{4}{7}$ hours?

5. At $\frac{3}{4}$ of a dollar a yard, what will 8 yards of cloth cost?

6. I bought $5\frac{1}{3}$ yards of cloth at $\frac{3}{4}$ of a dollar a yard. What did I pay for it?

7. Find the cost of $2\frac{3}{8}$ pounds of sugar, at $5\frac{1}{3}$ cents a pound.

8. What must I pay for 12 barrels of flour, at \$4¼ a barrel?

9. $3\frac{3}{4} \times 5\frac{1}{3} = ?$

10. My distance from the nearest grocery is $3\frac{3}{4}$ squares. John must walk $1\frac{1}{8}$ times as far. How far does John walk to the grocery?

EXERCISE.

301. 1. How many acres are there in 56 lots, each containing $\frac{5}{8}$ of an acre?

2. $2\frac{3}{4} \times 5\frac{1}{3} = ?$

3. $4\frac{1}{3} \times 3\frac{3}{8} = ?$

4. $22\frac{1}{6} \times 3\frac{3}{7} = ?$

5. Mr. Smith had 96 bushels of potatoes, which he sold for $\frac{3}{4}$ of a dollar a bushel. How much did he receive for them?

6. 5 men can do a piece of work in $10\frac{2}{6}$ days. How long will it take one man?

7. The distance from Indianapolis to Chicago is 192 miles. The distance to St. Louis is $1\frac{11}{12}$ times as great. How far is it from Indianapolis to St. Louis?

8. A man travels $12\frac{3}{4}$ miles a day. How far will he travel in $5\frac{1}{3}$ days?

MISCELLANEOUS PROBLEMS.

EXERCISE.

302. 1. Mr. Jones took $4\frac{1}{2}$ bushels of peaches to market on Tuesday, $3\frac{3}{4}$ bushels on Thursday, and $4\frac{1}{8}$ bushels on Saturday. How much did he receive, if he sold them at \$1¼ a bushel?

2. John gathered $1\frac{1}{2}$ dozen, $\frac{2}{3}$ dozen and $2\frac{1}{6}$ dozen of eggs at different times. He sold them at $\$.18$ a dozen. How much did he get for them?

3. A grocer bought a barrel of sugar holding 190 pounds. He kept 40 pounds for his own use. He sold the rest at $\$.05\frac{1}{2}$ a pound. How much did he receive for it?

4. Multiply the difference between $36\frac{1}{6}$ and $27\frac{5}{8}$ by $7\frac{1}{2}$.

5. Multiply $2\frac{4}{5}$ by $1\frac{1}{4}$, and divide the product by $1\frac{1}{6}$.

6. Divide the product of $2\frac{4}{5}$ and $8\frac{4}{5}$ by $3\frac{4}{5}$.

7. Multiply $10\frac{3}{5}$ by $9\frac{3}{4}$ and divide the product by $5\frac{1}{6}$.

8. What must be paid for 10 pairs of gloves, if one pair is worth $\frac{2}{3}$ of $\$3\frac{3}{4}$?

9. I bought $3\frac{3}{8}$ yards of velvet at $\$2\frac{1}{4}$ a yard, and $3\frac{3}{4}$ yards of silk at $\$1\frac{9}{10}$ a yard. What was my bill?

10. I have $\$3\frac{3}{4}$ in my purse. I spend $\frac{1}{5}$ of it for my dinner. How much must I pay for 11 such dinners?

11. I used $4\frac{1}{6}$ yards of broadcloth for my skirt and $2\frac{4}{5}$ yards for my jacket. How much more did the cloth of my skirt cost than that of the jacket, if the cloth is worth $\$2\frac{1}{4}$ a yard?

MENTAL EXERCISE.

303. 1. What is meant by the following: $\frac{2}{3}$ of an apple; $\frac{5}{8}$ of a cake; $\frac{1}{7}$ of a book?

2. Change $12\frac{3}{5}$ oranges to fifths of an orange;

$2\frac{3}{4}$ apples to eighths of an apple.

3. How many weeks are there in $\frac{50}{7}$ weeks?

4. How many pecks in $\frac{63}{8}$ pecks?

5. How many cents in $\frac{3}{4}$ of a dollar?

6. How many inches in $\frac{5}{6}$ of a yard?

7. Compare $\frac{2}{3}$ of a yard with $\frac{3}{4}$ of a yard, by means of inches.

8. Compare $\frac{3}{4}$ of a bushel with $\frac{7}{8}$ of a bushel, by means of quarts.

9. Compare $\frac{1}{2}$ of a dollar with $\frac{3}{8}$ of a dollar; $\frac{3}{8}$ of a dollar with $\frac{2}{8}$ of a dollar.

10. Show that $\frac{2}{3}$ and $\frac{8}{12}$ are of the same value.

11. $\frac{5}{9}$ of 63 is how much greater than $\frac{4}{7}$ of 42?

12. Three hours is what part of a day? Five hours?

13. Forty minutes is what part of an hour?

14. A train runs 30 miles an hour. How far will it run in 40 minutes?

15. In which of the fractions, $\frac{3}{4}$ and $\frac{5}{8}$, are the parts smaller?

16. Change $\frac{12}{18}$ to its lowest terms. Has the size of the parts increased or decreased? Has the number of parts increased or decreased?

17. $\frac{1}{3}$ of 2 apples is what part of one apple?

18. Which is greater, $\frac{1}{3}$ of 4 or $\frac{1}{4}$ of 5? How much greater?

19. My flower garden is $\frac{2}{3}$ of a rod long and $\frac{3}{8}$ of a rod wide; how many rods around it?

20. I drew a triangle which was $5\frac{2}{3}$ inches on one side, $4\frac{1}{2}$ inches on another, and $5\frac{1}{4}$ inches on another. How many inches around it?

21. What is the difference between $5\frac{1}{10}$ and $2\frac{3}{8}$?

22. The sum of two numbers is $16\frac{4}{5}$. One number is $8\frac{2}{3}$; what is the other?

23. $\frac{2}{3} - \frac{1}{5} = ?$

24. The difference between two fractions is $\frac{5}{12}$. One of the fractions is $\frac{1}{3}$; what is the other?

25. To how many people can you give 5⅔ barrels of flour, if you give ⅓ of a barrel to each person?

26. How many badges, each 1/16 of a yard in length, can I cut from 1⅞ yards of ribbon?

27. I wish to put 4¾ pounds of candy into eighth-pound packages. How many packages can I make?

28. If 10 oranges cost ⅖ of a dollar, what will 1 orange cost?

29. At $8¼ a yard, what will ⅘ of a yard of velvet cost?

30. There are 16½ feet in one rod. How many feet are there in 5 rods?

31. ⅞ of a quire of paper made one note-book; how many quires will be used in making 40 such books?

32. What will 10½ pounds of sugar cost, at 6½ cents a pound?

33. 2½ × 5⅓ = ?   3⅓ × 6½ = ?

34. Bananas sell at the rate of ⅚ of a dozen for ⅙ of a dollar. At that rate, what will 60 bananas cost?

35. 3 oranges are sold for a dime; what must I pay for 2¼ dozen?

36. Horace earns $1½ a day. In how many days, at that rate, can he earn $50?

37. Divide 25 by ⅝ of 3¾.

38. $8⅓ ÷ $⅚ = ?

39. A man owning ⅚ of a mill sells ⅔ of his share; what part of the mill does he still own?

40. If a jar holds ¾ of a gallon of fruit, how many jars will be required to hold 6 gallons?

41. If 3 pounds of coffee are sold for $1, what part of 3 pounds should be sold for 25 cents? What part of one pound?

42. A cake of ice $\frac{3}{4}$ of a foot thick floats $\frac{1}{6}$ of a foot above the water; what part of a foot is below the surface? How many inches are below the surface?

43. A boy bought $\frac{3}{4}$ of a bushel of chestnuts for $2, and sold them for 10 cents a quart; how much did he gain?

44. Take $\frac{1}{20}$ of a dollar from $\frac{4}{5}$ of a dollar, and with the remainder buy oranges at $\frac{3}{8}$ of a dollar a dozen. How many dozen can you buy?

45. A man is 42 years old, and $\frac{1}{7}$ of his age is $\frac{1}{3}$ of the age of his son. How is old his son?

46. 3 times $\frac{1}{2}$ of $\frac{2}{3}$ is how many times $\frac{4}{5}$?

47. Three-fifths of a ton of coal cost $6. What is the cost per ton?

48. 42 is $\frac{4}{9}$ of what number?

49. $\frac{5}{8}$ of a cord of wood was sold for $4.50; how much is it a cord?

50. 15 is $\frac{3}{8}$ of a number; what is $\frac{5}{6}$ of the same number?

51. If $\frac{5}{8}$ of a yard of ribbon cost 25 cents, what will $\frac{1}{4}$ of a yard cost?

52. One-eighth of a ton of coal costs $\frac{3}{4}$ of a dollar. What will $\frac{2}{3}$ of a ton cost?

53. Three-fourths of a yard of ribbon cost 12 cents. Find the cost of 3 yards.

54. Five-sixths of a yard of cloth cost 2\frac{1}{2}$. Find the cost of 2 yards.

55. Five-eighths of the cost of to-day's meals are $\frac{1}{2}$ of 2\frac{1}{2}$. What is the cost of to-day's meals?

56. $24 are $\frac{3}{4}$ of my money. Find $\frac{1}{4}$ of it, without finding all of it.

57. 1\frac{3}{4}$ is the cost of $\frac{7}{8}$ of a pound of tea. Find the cost of $\frac{7}{16}$ of a pound, without finding the cost of 1 pound.

58. John had 48 marbles in his bag, which were $\frac{4}{9}$ of all his marbles. He gave away $\frac{1}{8}$ of his marbles. How many did he give away?

59. I pay \$.09 for $\frac{3}{4}$ of a yard of ribbon. How much must I pay for $\frac{4}{8}$ of a yard?

60. Mr. Hoover receives \$.15 for $\frac{3}{4}$ of a pound of coffee. How much would he receive for $3\frac{1}{2}$ pounds?

61. $\frac{3}{8}$ of a yard of cloth cost $\frac{3}{8}$ of a dollar. What will $\frac{5}{16}$ of a yard cost?

62. I pay \$5$\frac{1}{4}$ for $\frac{3}{4}$ of a barrel of flour. Find the value of $\frac{4}{7}$ of a barrel.

63. A man is 63 years old. $\frac{1}{9}$ of his age is $\frac{1}{6}$ of the age of his son. How old is the son?

64. $\frac{1}{4}$ of my money is $\frac{1}{12}$ of yours. I have \$24. How much have you?

65. \$20 is $\frac{1}{8}$ of a man's salary. Find $\frac{3}{4}$ of his salary.

66. A man bought a cow for \$35, and $\frac{4}{7}$ of that sum was $\frac{1}{3}$ of what he paid for a horse. What did he pay for the horse?

EXERCISE.

304. 1. In three pieces of carpeting that contain $44\frac{3}{4}$ yards, $39\frac{3}{8}$ yards, and $53\frac{1}{3}$ yards, there are how many yards?

2. I sold a horse for \$185$\frac{1}{4}$ and thereby lost \$9$\frac{1}{2}$. How much did the horse cost?

3. A miner digs $16\frac{1}{3}$, $21\frac{3}{4}$, and $18\frac{1}{4}$ ounces of gold. He loses $3\frac{3}{8}$ ounces in washing. How much gold has he left?

4. Add $219\frac{4}{9}$, $407\frac{1}{3}$ and $328\frac{2}{3}$, and from the sum take $458\frac{3}{8}$.

5. A farmer sold two loads of hay, one for \$15$\frac{3}{4}$ and the

other for $18⅜, and received $29½ down; how much is still due?

6. From 10¼ take the difference between 3¾ and 8½.

7. Among how many families can 93¾ pounds of flour be divided, if each family gets 6¼ pounds?

8. At $5⅝ a cord, how many cords of wood can be bought with $72½?

9. My father gave me $5¾, and my mother $6⅝. How many books, at $1¼ apiece, could I buy with the money?

10. I had 25¾ acres of land. After giving a number of acres to my son, I sold the remainder for $225, at $22½ per acre. How many acres did I give to my son?

11. A man paid $63 for 5¼ tons of coal. What was the price per ton?

12. A woman paid $51¼ for 13⅔ yards of satin. How much was it a yard?

13. What will one basket of peaches cost, if 13½ baskets cost $16⅛?

14. I paid ⅝ of $4¼ for a plate. How many such plates could be bought with $20₁₀⁴?

15. A man having $⅞⅝ spent ₁₁⁵ of it. How much had he left?

16. Find the value of ⅛ of ⅔ of a sailboat which is worth $720.

17. I paid $626 for 8 lots. How much, at that rate, are 7 lots worth?

18. Seven plates are worth $8¾. What are 9 such plates worth?

19. Samuel walked ⅞ of 11⅔ miles. Thomas only traveled ₁₄⁵ as far as Samuel. How far did Thomas walk?

20. A lady had \$35 and spent $\frac{4}{7}$ of it for a watch. How much had she left?

21. A grocer bought 63 gallons of oil and sold $\frac{7}{9}$ of it. How many gallons had he left?

22. Mary had \$15 and spent $\frac{3}{8}$ of it for lace. How much money had she left?

23. Mr. Smith bought 12 gallons of vinegar, and used $\frac{5}{8}$ of a gallon. How many gallons were left?

24. Divide $\frac{5}{12}$ of $3\frac{3}{8}$ by $\frac{3}{8}$ of $3\frac{1}{2}$.

25. From 240 acres of land, $43\frac{4}{5}$ acres are sold to one man, and $\frac{1}{3}$ of the remainder to another. How many acres remain unsold?

26. If $9\frac{1}{2}$ tons of hay cost \$95, how many tons can be bought for \$120?

27. $28\frac{4}{5}\times13\frac{11}{12}=?$

28. $13\frac{3}{8}+19\frac{1}{4}+11\frac{2}{3}+18\frac{1}{5}=?$

29. At the rate of $9\frac{1}{3}$ miles an hour, how far can a boy travel on a bicycle, riding $3\frac{7}{12}$ hours in the forenoon and $2\frac{3}{4}$ hours in the afternoon?

30. Bought 47 yards of cloth; kept $8\frac{1}{4}$ yards, and sold the remainder at \$3 a yard. What did I get for it?

31. $13\frac{3}{8}\times6\frac{1}{4}\div16\frac{2}{3}=?$

32. $1\frac{1}{4}\div2\frac{3}{8}\times8\frac{13}{18}=?$

33. Multiply $1\frac{1}{2}\div2\frac{1}{3}$ by $\frac{3}{4}\div4\frac{1}{2}$.

34. Find the value of $\frac{3}{8}$ of $2\frac{2}{7}\div(1\frac{6}{7}-\frac{3}{4})$.

35. What is the value of $\frac{2}{3}$ of $\frac{11}{12}\div\frac{1}{4}$ of $5\frac{1}{2}$?

36. How many weeks will it take to spend \$182, if my weekly expenses are \$22$\frac{3}{4}$? If my income is \$37$\frac{1}{2}$ a week, how much do I save in that time?

37. $13\frac{3}{4}\times4\frac{2}{3}\div18\frac{3}{4}=?$

38. If a man travels 630 miles in $8\frac{3}{4}$ days, how far would he travel in $5\frac{1}{2}$ days, at the same rate?

39. The value of $\frac{7}{8}$ of a farm is $4,746. Find value of the whole farm.

> The value of $\frac{7}{8}$ of the farm = $4,746.
> The value of all of the farm = $4,746 × $\frac{8}{7}$ = $5424.

40. I own $\frac{5}{8}$ of a store. I sell $\frac{3}{4}$ of my share for $120. Find the value of the store.

41. How much cloth can be bought for $27, if $\frac{2}{3}$ of a yard cost $2\frac{2}{5}$?

42. A man drives 45 miles in $4\frac{1}{2}$ hours. At that rate, how long will it take him to drive 75 miles?

43. A man receives $100 for $5\frac{4}{5}$ weeks' labor. How much should he receive for working $8\frac{4}{5}$ weeks?

44. $4\frac{2}{3} \times 14\frac{1}{8} \div 3\frac{1}{2} = ?$

45. Mr. Harrow sold $\frac{3}{7}$ of his land and had 104 acres left. How many acres had he at first?

46. A boy used $\frac{2}{3}$ of the nails in a paper bag, and found on counting them that the bag still contained 553 nails. How many were in the bag at first?

47. I spent $\frac{1}{4}$ and $\frac{1}{5}$ of my money and had $220 left. How much had I at first?

48. After spending $\frac{1}{5}$, $\frac{2}{5}$, and $\frac{1}{4}$ of my money, I had $783 left; how much had I at first?

49. I withdrew $\frac{5}{8}$ of my money from bank, leaving $725. How much did I withdraw?

50. I had a certain distance to walk. I walked $\frac{1}{5}$ of it in the morning, $\frac{1}{4}$ of it in the afternoon and the rest, which was 5 miles, in the evening. How far did I walk all together?

51. Mr. Atwood sold $\frac{1}{3}$ of his farm at one time, $\frac{1}{4}$ of it at

another, ⅛ of it at another, and had 53 acres left. How many acres did he sell in all?

52. Mary had 224 beads. This was ¼ more than Jane had. How many had Jane?

53. Mr. Holman sold a piece of furniture for $50.80, gaining ¼ of the cost. What did it cost him?

54. Mr. Smith has property valued at $1600. ⅞ of this is ⅓ of the value of Mr. Jones's property. How much is Mr. Jones's property worth?

55. My father's farm produced 625 bushels of wheat; ½ of this is ⅝ of what our neighbor raised on his farm. How many bushels did our neighbor raise?

56. I paid $8.75 for ⅞ of a ton of anthracite. The next month I bought ¾ of a ton. How much did I have to pay the second time, at the same rate?

CHAPTER VIII.

DECIMAL FRACTIONS.
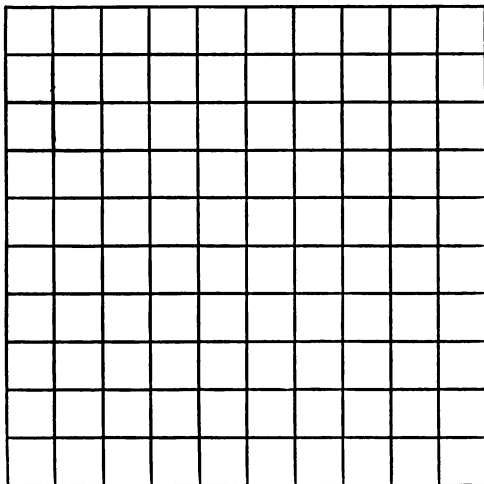
305. How many rows are there in this square?

One row is what part of the whole? Write the fraction which expresses this. What is the denominator? What is the numerator?

$\frac{1}{10}$ of anything may also be written .1.

$.1 is one way of writing $\frac{1}{10}$ of a dollar, or $\$\frac{1}{10}$, which is one dime.

$.10 may be read as "one dime and no cents," and has the same value as $.1, for both are $\frac{1}{10}$ of a dollar.

In this way of writing fractions, removing the cipher from the right does not change the value. Express $\frac{2}{10}$ in another way. (.2.)

Express in the same way $\frac{3}{10}$, $\frac{6}{10}$, $\frac{9}{10}$, $\frac{10}{10}$.

306. Two rows of this square are what part of the whole square?

Show another way of expressing this same fraction.

Two rows are also what part of 10 rows? ($\frac{1}{5}$.)

Give three ways in which you may express the relation of 2 rows to the whole square.

The first place to the right of the decimal point expresses rows of the square, or tenths of the square.

NOTE.—Have the class work with 4 rows, 5 rows, 6 rows, 8 rows, and 10 rows.

307. How many squares are there in each row?

How many squares are there in the large square?

One small square is what part of the whole square?

What is the denominator?

What is the numerator?

How would you express $\frac{1}{100}$ of a dollar? (1 cent or $.01.)
$\frac{3}{100}$ of a dollar? $\frac{8}{100}$ of a dollar? $\frac{10}{100}$ of a dollar?

Compare .1 of a dollar and .10 of a dollar.

What is another way of expressing $\frac{5}{100}$ of a dollar? $\frac{5}{100}$ of anything?

.01 of the whole square is how many small squares? .03 of the whole square? .09 of the whole square?

308. Fractions whose denominators are 1 with zeros annexed are called **Decimal Fractions.** $\frac{1}{10}$, $\frac{3}{100}$ and $\frac{11}{10000}$ are decimal fractions. The denominator of a decimal fraction is usually not written, but the idea is expressed by the numerator and the decimal point. The usual form of writing the decimal fractions given above is : .1, .03 and .0011.

Decimal is from a Latin word meaning *ten*.

309. Fractions whose denominators are *not* 1 with ciphers annexed are called **Common Fractions.** $\frac{2}{3}$, $\frac{5}{8}$, $\frac{11}{20}$, and $\frac{7}{800}$ are common fractions.

310. Ten squares are what part of the whole square? ($\frac{10}{100}$.)

Express this fraction as a decimal.

Ten small squares are the same as what?   (1 row.)

We know that 1 row is what part of the whole square?

Show the four ways in which you may express the relation of 10 small squares to the whole square.

311. Twenty-five small squares are what part of the whole square?

Express it decimally.

Twenty-five small squares are how many rows?

$2\frac{1}{2}$ rows are what part of the whole?   (.$2\frac{1}{2}$ or $\frac{1}{4}$.)

Give four ways of expressing the value of 25 squares.

($\frac{25}{100} = .25 = .2\frac{1}{2} = \frac{1}{4}$.)

Note.—Have the class work with 50 squares, 75 squares, 100 squares.

312. One row of squares is what part of the whole? (.1.)

One small square is what part of the whole?   (.01.)

One row and one small square is what part of the whole? (.11.)

Compare the value of the figure in the *second* place to the right of the decimal point with that of the figure in the *first* place to the right of the decimal point, describing them as parts of the square. (1 row = 10 small squares; 1 small square is $\frac{1}{10}$ of 10 small squares.)

Compare the value of the number in the second decimal place with that of the number in the first decimal place. $(.1 = .10; .01 = \frac{1}{10}$ of .1.)

Fundamental Processes.

NOTE.—The class should review work showing the processes which may be performed with like numbers ; also the work showing that the processes of addition, subtraction, division and comparison may sometimes be performed with unlike numbers; as 6 bushels and 2 pecks.   (§ 257.)

313. Add, subtract, divide, and compare .6 and .2, in the language of the square.

> 6 rows and 2 rows = 8 rows.
> 6 rows less 2 rows = 4 rows.
> 6 rows ÷ 2 rows = 3 (times).
> 2 rows = $\frac{1}{3}$ of 6 rows.
> 6 rows are 4 rows more than 2 rows.
> 2 rows are 4 rows less than 6 rows.

Perform these processes in the language of United States money.

Add, subtract, divide, and compare .6 and .2, as decimal fractions.

314. Add, subtract, divide and compare .6 and .15 in the same manner as shown in § 313.

> 6 rows = 60 small squares.
> 60 small squares and 15 small squares = 75 squares.

> 6 dimes = 60 cents.
> 60 cents + 15 cents = 75 cents.

Name the least number of coins you can have when you have 75 cents.   What other coins taken together will make 75 cents ?

6 tenths = 60 hundredths.
60 + 15 = 75.

NOTE.—The teacher should make original problems.

WRITING AND READING DECIMALS.

315. Can you imagine an oblong that is 100 inches long and 10 inches wide?

NOTE.—This could be drawn on the blackboard—10 inches high, 100 inches long.

How many one-inch squares would there be in this oblong?   (1000.)
One one-inch square is what part of the oblong?
Express this decimally.
What is the denominator?   What is the numerator?
If a dollar sign were placed in front of this, in what two ways might it be read?   (One thousandth of a dollar or 1 tenth of a cent.)

316. Ten one-inch squares are what part of the oblong? ($\frac{10}{1000}$.)
Ten one-inch squares are the same as what?   (1 row.)
One row is what part of the oblong?   ($\frac{1}{100}$ or .01.)
Give the four ways of expressing the value of 10 one-inch squares.

317. Five hundred one-inch squares are what part of the whole?   ($\frac{500}{1000}$ or .500.)

Five hundred one-inch squares are what part of the 1000 one-inch squares?   ($\frac{1}{2}$.)

Five hundred one-inch squares are the same as how many rows?

Fifty rows are what part of the oblong?   ($\frac{50}{100}$ or .50.)

Give five or more ways of expressing the relation of 500 one-inch squares to the 1000 one-inch squares.

318. Express the following in decimal form:

$\frac{6}{10}$, $\frac{4}{10}$, $\frac{35}{100}$, $\frac{75}{100}$, $\frac{230}{1000}$, $\frac{350}{1000}$, $6\frac{8}{10}$, $25\frac{4}{100}$, $36\frac{4}{1000}$.

6 hundredths.	19 hundredths.	60 thousandths.
25 hundredths.	40 thousandths.	9 and 7 tenths.
301 thousandths.	97 hundredths.	6 and 7 hundredths.

Read the following decimals:

.5	.06	.145	3.45	.700
.05	.60	.265	4.89	4.900
.15	.56	.103	5.07	4.009
.30	.84	.047	7.008	6.800
.45	.96	.006	9.037	6.080

REDUCTION.

To change Decimals to Common Fractions.

319. Change .6 to a common fraction in lowest terms, having the same value.

$$.6 = \tfrac{6}{10} = \tfrac{3}{5}.$$

To change a decimal to a common fraction, write the denominator under the decimal, omit the decimal point, and change the fraction to its lowest terms.
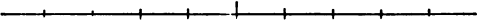
EXERCISE.

320. Change to equivalent common fractions or mixed numbers:

1. .8.	8. .015.
2. .75.	9. .275.
3. .9.	10. .048.
4. .60.	11. .009.
5. .625.	12. 5.36.
6. .35.	13. 3.25.
7. .15.	14. 15.75.

To Change Common Fractions to Decimals.

——————————————|—————————— **321.** 1. Draw a line and divide it into halves. Express the divided line fractionally. (²⁄₂.)

—·—·—·—·—|—·—·—·—·— 2. Draw a line and divide it into 10 equal parts. Express it fractionally. (¹⁰⁄₁₀ or 1.0.)

3. Imagine the line cut into 100 equal parts; express it fractionally. (¹⁰⁰⁄₁₀₀ or 1.00.)

We see that 1 = 1.0 or 1.00 or 1.000, etc.

4. Express 5 as tenths, hundredths, thousandths. (5 = 5.0 or 5.00 or 5.000.)

5. Express ½ decimally. (½ of ¹⁰⁄₁₀ or ½ of 1.0 = .5.   ½ = .5.)

6. Express ⅛ decimally. (⅛ of 1.000 = .125.)

7. Express ¾ decimally. (¾ of 1.00 = .75; or ¼ of 3.00 = .75.)

To change a common fraction to a decimal, express the numerator decimally and divide by the denominator.

EXERCISE.

322. Change to equivalent decimals:

1. $\frac{1}{2}$.	8. $\frac{5}{4}$.	15. $\frac{13}{50}$.
2. $\frac{1}{4}$.	9. $\frac{2}{8}$.	16. $\frac{7}{25}$.
3. $\frac{3}{4}$.	10. $\frac{7}{8}$.	17. $3\frac{1}{2}$.
4. $\frac{4}{4}$.	11. $\frac{4}{8}$.	18. $7\frac{3}{4}$.
5. $\frac{1}{5}$.	12. $\frac{4}{6}$.	19. $12\frac{5}{16}$.
6. $\frac{3}{4}$.	13. $\frac{5}{8}$.	20. $42\frac{4}{25}$.
7. $\frac{3}{8}$.	14. $\frac{4}{16}$.	21. $26\frac{3}{8}$.

ADDITION OF DECIMALS.

NOTE.—Review addition as given in § 313 and § 314.

323. 6 tenths + 15 hundredths = ?

> 6 tenths = 60 hundredths.
> .60 + .15 = .75
>
> or
>
>   .60
>   .15
>   ‾‾‾
>   .75

Find the sum of 25.4, 120.7, 216.009, and .496.

25.4
120.7
216.009
  .496
‾‾‾‾‾‾
362.605

Write the numbers so that units of the same order stand in the same column. Begin at the right and add as in addition of integers.

324. Find the sum of:

1. .680, .729, .006, .3, .40, and .400.
2. 65.789, 36.908, 45.8, and 3001.601.
3. 8.675, 34.604, .007, .897, and 189.3.
4. 1009.09, 3040.60, 10001.345, .009, and 987.
5. 62.5 yards + 95.7 yards + 67.25 yards + 9.48 yards.
6. 9 and 101 thousandths, 7 and 3 tenths, 15 and 75 hundredths, 38 and 25 thousandths.
7. One hundred eleven thousandths, two hundred twenty-five thousandths, sixteen tenths, one hundred five and one hundred five thousandths, three hundred fifty and three hundred thousandths.
8. Add as decimals: $56\frac{1}{8}$, $49\frac{2}{10}$, $42\frac{1}{2}$, $39\frac{3}{4}$, $15\frac{7}{8}$.

SUBTRACTION OF DECIMALS.

NOTE.—Review subtraction as given in § 313 and § 314.

325. From .04 take .005.

$$.4 = .400 \qquad .400 - .005 = .395.$$

or

$$
\begin{array}{r}
.400 \\
.005 \\
\hline
.395
\end{array}
$$

From 45.75 take 26.9.

$$
\begin{array}{r}
45.75 \\
26.9 \\
\hline
18.85
\end{array}
$$

Write the subtrahend under the minuend, so that units of the same order shall stand in the same column, and subtract as in the subtraction of integers.

From 64.7 take 19.013.

64.700   If there are more decimal places in the subtrahend
19.013   than in the minuend, fill the vacant decimal orders of
          the minuend with ciphers.

EXERCISE.

326. Find the difference between:

1. 303.48 and 199.09.
2. 87.076 and 65.005.
3. 1005.15 and 105.015.
4. .8 and .08.
5. 9 tenths and 9 thousandths.
6. 101.009 and 81.998.
7. 1616.161 and 987.90.
8. 7 hundredths and 7 thousandths.
9. 90 hundredths and 90 thousandths.
10. From 80 thousand and 80 thousandths take 8 thousand and 8 thousandths.
11. Find the difference between seven and seven tenths, and seven and seven thousandths.
12. A man walked 42.5 miles the first day and 17.875 miles the second. How much farther did he walk the first day than the second?

DIVISION OF DECIMALS.

NOTE.—Review division as given in § 313 and § 314.

EXERCISE.

327. 1. At $15 apiece, how many books may be bought with 6 dimes?

6 dimes = 60 cents.
60 cents + 15 cents = 4.

You can get 4 books.

2. $\$.8 \div \$.02 = ?$ 8. $\$5.5 \div \$.25 = ?$
3. $\$.02 \div \$.005 = ?$ 9. $\$2.1 \div \$.35 = ?$
4. 15 acres $\div$ .5 acres $= ?$ 10. 15.3 gal. $\div$ 5.1 gal. $= ?$
5. $\$2 \div \$.05 = ?$ 11. $\$4.6 \div \$1.15 = ?$
6. 5 bu. $\div$ 2.5 bu. $= ?$ 12. $\$.5 \div \$.00\frac{1}{2} = ?$
7. 8 pecks $\div$ 1.6 pecks $= ?$ 13. $\$3.8 \div \$.76 = ?$

EXERCISE.

328. 1. What part of a gallon of milk can be bought
with $.04, if milk sells for .2 of a dollar per gallon?

.2 of a dollar = 20 cents.
4 cents ÷ 20 cents = $\frac{4}{20} = \frac{1}{5} = .2$.
        or
$\$.04 \div \$.2 = \$.04 \div \$.20 = .2$.

.2 of a gallon of milk can be bought for $.04.

2. $\$.08 \div \$.4 = ?$

$\$.08 \div \$.4 = \$.08 \div \$.40 = \frac{8}{40} = \frac{1}{5} = .2$.

3. $.04 \div .2 = ?$ 5. $\$.4 \div \$.2 = ?$
4. $.5 \div 2.5 = ?$ 6. $.63 \div 4.5 = ?$

$.63 \div 4.5 = .63 \div 4.50 = \frac{63}{450} = \frac{7}{50} = \frac{700}{50} = .14$.

7. 25 bushels $\div$ 5 bushels $= ?$ 11. $\$1.2 \div \$24 = ?$
8. 2 pints $\div$ 25 pints $= ?$ 12. $2 \div 2.5 = ?$
9. $\$1.5 \div \$2.5 = ?$ 13. $1.2 \div 2.4 = ?$
10. $2.04 \div 25.5 = ?$ 14. $3.6 \div 7.2 = ?$

EXERCISE.

329. 1. A man earns .2 of a dollar in one hour. In how many hours can he earn .5 of a dollar?

> .5 of a dollar ÷ .2 of a dollar = 2¼.
> 2¼ = 2.5.

It will take him 2.5 hours.

2. $.9 \div .4 = ?$

> $.9 \div .4 = \tfrac{9}{4} = 2\tfrac{1}{4} = 2.25.$

3. $.7 \div .5 = ?$	7. $9 \div 3.6 = ?$	11. $16.8 \div 3.5 = ?$
4. $2 \div .8 = ?$	8. $1.25 \div .5 = ?$	12. $15.5 \div 5 = ?$
5. $5 \div 4 = ?$	9. $3.125 \div .25 = ?$	13. $36.4 \div 8 = ?$
6. $16 \div 2.5 = ?$	10. $6.25 \div 2.5 = ?$	14. $29.7 \div 9 = ?$

330. 1. Divide 16.048 by 3.4. 2. Divide 9.5 by .25.

```
3.4 ) 16.048 ( 4.72          .25 ( 9.50 ( 38
      13 6                        7 5
      ────                        ───
       2 44                       2 00
       2 38                       2 00
       ────                       ───
         68
         68
         ──
```

9.5 = 950 hundredths ÷ 25 hundredths = 38, an integral number.

Divide as in the division of integers, and point off as many decimal places in the quotient as the number of decimal places in the dividend exceeds the number in the divisor.

1. When the dividend has fewer decimal places than the divisor, annex ciphers to the dividend.
2. When the quotient has not enough decimal figures, prefix ciphers.
3. When there is a remainder, the division may be continued by annexing ciphers to the dividend.

EXERCISE.

331. 1. I have $.72 with which to buy starch at $.045 a pound. How many pounds can I buy?

2. A candy dealer has 35 pounds of candy to place in bags, each holding .875 of a pound. How many bags will be needed?

3. Mr. Brown bought 60 acres of land and divided it into lots, each containing .75 of an acre. How many lots does he have?

4. A furniture dealer has $330 with which to buy chairs at $7.5 apiece. How many chairs can he buy?

5. Flannel sells for .625 of a dollar per yard. At that rate, how many yards could I buy with $11.25?

6. A man who owns a paper stand makes $16.35 per week. How many papers does he sell in a week if he makes .0025 of a dollar on each paper?

7. .0007 ÷ .45 = ?

8. At $9.875 an acre, how many acres of land would I receive for $63.99?

Divide:

9. 34.5 by .15.

10. 34.5 by .015.

11. 5.5 by 1.25.

12. 5.5 by .0125.

13. 450.5 by 1.75.

EXERCISE.

332. 1. One-half of $6 = ?   One-half of 6 cents = ?   Of .06 = ?   Of .006 = ?

2. A man divided .16 of a square mile of land between 2 men. What part of a square mile did each receive?

<div align="center">

2) .16 of a square mile.

.08 of a square mile.

</div>

Each man received .08 of a square mile.

3. Mr. Smith bought .625 of an acre of land. He divided it so as to have 5 equal garden plots. What part of an acre did each plot contain?

4. I paid $.75 for 4 yards of ribbon. How much was it per yard?

5. Eight bushels of peaches sell for $6. How much are they per bushel?

6. I paid $.09 for .3 of a yard of embroidery. How much was it a yard?

<div align="center">

3) $.09 = cost of .3 of a yard.

$.03 = cost of .1 of a yard.

10 (10 times .1 = 1).

$.30 = cost of 1 yard.

</div>

7. $.80 is the cost of .25 of a yard of silk. Find the cost of a yard.

8. Eighteen cents are .9 of what I paid for some tablets. What did I pay for them?

9. .8 of a gallon of cream cost $.30. How much does a gallon cost?

10. I paid $.50 for 2.5 yards of ribbon. Find the cost of 1 yard.

<div align="center">

2.5) $.500, cost of 2.5 yards.

$.20, cost of 1 yard.

</div>

11. I paid $.70 for 3.5 pounds of porterhouse steak. How much did I pay for one pound?

12. 4.8 yards of shirt-waist material cost me $1.44. How much was it per yard?

13. I paid $99 for 4.4 acres of land. How much did I pay for one acre?

14. Mr. Berry bought a farm for $1200 and sold it so as to gain 25% of the cost. What was his gain?

15. Our neighbor receives a salary of $1500 per year. He pays 33⅓% of this for house rent. How much money has he left after paying his rent?

MULTIPLICATION OF DECIMALS.

NOTE.—Introduce this work by means of one hundred one-inch squares, supplemented by United States money.
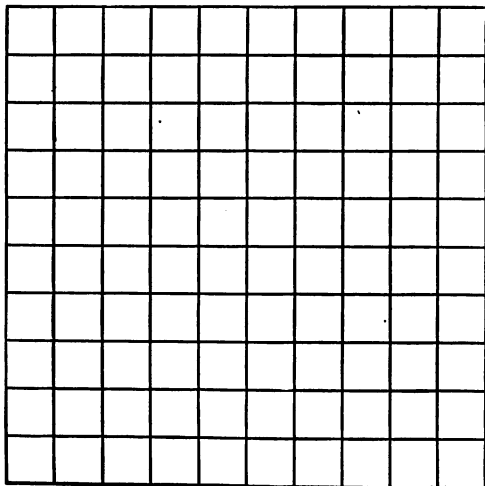
333. 1. 2 times 1 row = ?

2. 1 row is what part of the whole?

3. 2 times .1 = ?

4. 10 times .1 = ?

5. 5 times .2 = ?

6. 5 times 4 rows = ?

7. 5 times .4 = ?

8. 8 times .4 = ?

9. 9 times .5 = ?

10. 2.5 times .4 = ?

11. 5.5 times .8 = ?

12. 2.2 times .5 = ?

13. 4 times 1 small square = ?

14. 1 small square is what part of the whole?

15. .01×4=?   17. .10×10=?   19. 5.5×10=?

16. .02×4=?   18. 4.5×10=?   20. 6.5×10=?

<div align="center">EXERCISE.</div>

334. 1. 2 times 2.1 = ?   5. 4.8×3=?

2. 5.2×3=?   6. 2.5×2=?

3. 5.3×6=?   7. 4.2×10=?

4. 4.6×5=?   8. 8.1×5=?

<div align="center">EXERCISE.</div>

335. 1. Multiply .253 by .35.

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  .253
   .35
 ─────
  1265
   759
 ─────
.08855
```
Multiply as in whole numbers, and point off as many decimal places in the product as there are in both multiplicand and multiplier.   If there are not enough figures in the product to fill the decimal places, prefix as many ciphers as are necessary to make the required number.

Multiply:

2. .386 by .47   6. 49.3 by .064

3. .231 by .36   7. 492 by 3.8

4. 48.2 by 25   8. 384.45 by .64

5. 48.2 by .25   9. 38.445 by .64

10. What is the cost of 26.25 pounds of sugar, at $.0625 per pound?

11. One acre of land produces 48.375 bushels of wheat. How many bushels will 7.25 acres produce?

12. At $6.37 a ton, what must be paid for 5.25 tons?

336. 1. Make decimal fractions of the following: $\frac{3}{20}$; $\frac{4}{10}$; $\frac{19}{12}$; $\frac{125}{1000}$; $\frac{13}{50}$.

2. State the numerator and the denominator of the following: .03; 1.25; .075; .0075; .00205.

3. Change to common fractions in lowest terms: .4; .05; .6; .12; .75; .8; .24; .50; 2.5; .16⅔.

4. Compare the values of:

.6 and $\frac{3}{5}$;   .04 and $\frac{1}{4}$;

.05 and $\frac{1}{2}$;   .875 and $\frac{7}{8}$.

5. Change to decimal fractions:

$\frac{1}{2}$; $\frac{1}{3}$; $\frac{1}{4}$; $\frac{3}{4}$; $\frac{1}{6}$; $\frac{7}{8}$; $\frac{9}{16}$; $\frac{2}{5}$; $\frac{3}{8}$; $\frac{1}{5}$; $\frac{3}{25}$; $\frac{9}{50}$.

6. What decimal of a pound do I buy in buying $\frac{5}{8}$ of a pound of coffee?

7. $\frac{5}{16}$ of a foot is what decimal of a foot?

8. Change $\frac{1}{2}$ and $\frac{3}{4}$ to decimals and add.

9. Add one hundredth and one tenth.

10. I paid $\frac{5}{8}$ of a dollar for a knife and $\frac{3}{4}$ of a dollar for a book.   How many dollars and cents did I spend?

11. Add $\frac{3}{8}$ and $\frac{1}{4}$ as decimals.

12. $\frac{4}{5}$ and $\frac{3}{4}$ are equal to what decimal?

13. A boy spends .33⅓ of a day in sleep and $\frac{1}{4}$ of a day in study.   What fractional part of a day is left?

14. Subtract one hundredth from one tenth.

15. A man has 10 loads of hay and sells .05 of a load; how much hay has he left?

16. From the sum of 4.4 and .08 take 4.1.

17. From 4.4 take the difference between .04 and 4.1.

18. 4×.05 is what common fraction?

19. One book costs 8 hundredths of a dollar. What will 9 such books cost? ($.08 × 9 =   .)

20. .3 × .005 = ?

21. What is the shortest way of multiplying .48 by 100?

22. Change ⅞ to a decimal, take away .01, and multiply by 100.

23. From 1 take .001, and multiply by a thousand.

24. I own .1 of a farm and sell ½ of my share. What decimal part of the farm do I sell?

25. When apples are $\frac{6}{10}$ of a dollar a bushel, what must you pay for .7 of a bushel?

26. Divide $8 into 400 equal parts.

27. From 1 take .001 and multiply by 100.

28. Ten men can do a piece of work in 2.1 days. How long will it take one man to do it?

29. .1 of .01 = ?

30. At $2 a yard, how much silk can be bought with $.40?

31. I buy a cord of wood for $5 and sell it for $5.50. The gain is what decimal part of the cost?

32. Multiply .75 by 10, and divide the product by .03.

33. A man gained 4 mills, or $0.004, on a quart of nuts. How many quarts must he sell to gain $.40?

34. What is the quotient of .1 divided by .01?

35. A grocer bought potatoes at $.40 a bushel and sold them so as to gain 10%, or .10, of the cost. What was the gain on the bushel?

36. My watch cost me $60. I sold it so as to lose 25%, or .25, of the cost. What did I lose?

MISCELLANEOUS PROBLEMS.

337. 1. The subtrahend is eight thousand and forty-eight thousandths, and the remainder is eight hundred seventy-three thousandths; what is the minuend?

2. There are 228.35 barrels of water in a cistern which will hold 410.5 barrels; how many barrels will be needed to fill the cistern?

3. At .085 of a dollar per dozen, what will 10¾ dozen steel pens cost?

4. From a barrel containing 43 gallons of vinegar, .125 gallons were drawn at one time, 3.5 at another, and .75 at another; how many gallons remained in the barrel?

5. Dry goods valued at $8000 were destroyed by fire; what would a man lose who owned .12 of the goods?

6. A gallon, liquid measure, contains 231 cubic inches; how many gallons are there in 13051.5 cubic inches?

7. At $6.80 an acre, how many acres of land can be bought for $4258?

8. Bought 17 chests of tea, each containing 59 pounds, at $0.67 a pound, and gave in exchange 118 bags of wheat, each containing 3.4 bushels; what was the value of the wheat per bushel?

9. When the dividend is .1 and the divisor 12.8, what is the quotient?

10. What is the quotient of 312.5 by 85?

11. If 38 yards of cloth cost $180.50, what will be the cost of 26 yards?

12. At $2.56 per yard, how many yards of cloth can be bought for $94.4?

13. From $62.40 take $7.37½.

14. A druggist sold 375 gallons of ink in bottles holding .375 of a gallon each; how many bottles of ink did he sell?

15. By selling a carriage for $195, I lost $34.50. For how much should I have sold it to gain an amount equal to .7 of what I lost?

16. From the sum of $15.75 and $1001.10 take the sum of $101.018 and $50.101.

17. Subtract $.50 from $1.005.

18. A man bought a coat for $16, a vest for $3.50, and a pair of trousers for $5.50; what two coins will exactly pay for them?

19. From the sum of $14.50 and $12.75 take 6 dimes 6 mills.

20. From $4.50 take 37½ cents.

21. A grocer bought 3 barrels of apples for $6.75, a box of lemons for $2.50, and 5 barrels of flour for $30.00. He handed the merchant two gold pieces, and received $.75 in change. What were the two pieces of money?

22. At $.12½ a yard, how much muslin can be bought for $20.43?

23. If ¾ of a yard of cloth cost $2.16, what will be the cost of 5½ pieces, each containing 47 yards?

24. When rice is selling at $.075 a pound, how many pounds can be bought for $5.25?

25. How many days, of 9 hours each, must a man work in order to earn $576.72, at 18 cents an hour?

26. If a lady earns $15.00 a week, and spends an average amount of $11.37½, in how many weeks will she save $166.75?

27. 31.5 gallons of vinegar cost $11.81¼; how much is that per gallon?

CHAPTER IX.

COMPOUND NUMBERS.

NOTE.—Only so much of Compound Numbers should be used as seems to be adapted to the age and development of the pupils.

338. A **Simple Quantity** is expressed in units of one denomination; as 4 pecks.

A **Compound Quantity** is expressed in units of different denominations which may be reduced to units of the same denomination; as 4 pecks, 3 quarts.

339. A **Denominate Number** is a number composed of denominate units.

A **Simple Denominate Number** is composed of units of one denomination; as 5 gal. or 13 bu.

A **Compound Denominate Number** is composed of units of two or more denominations which may be reduced to units of the same denomination; as 4 lb. 9 oz.

340. Reduction is the process of changing the denomination of a number without changing its value.

In reducing denominate numbers, the increase or decrease in the number of units is irregular, instead of by *ten* as in simple numbers.

DRY MEASURE.

341. Dry measure is used in measuring grain, fruit, seeds, vegetables, and other dry articles.

The denominations are *pints, quarts, pecks,* and *bushels.*

$$2 \text{ pints (pt.)} = 1 \text{ quart (qt.).}$$
$$8 \text{ quarts} = 1 \text{ peck (pk.).}$$
$$4 \text{ pecks} = 1 \text{ bushel (bu.).}$$

$$1 \text{ bu.} = 32 \text{ qt.} = 64 \text{ pt.}$$

The standard bushel is 18½ inches in diameter and 8 inches deep, and contains 2150.42 cubic inches.

1. How many bushels in 24 pecks? In 25 pecks? In 35 pecks?

2. Reduce 5 bushels to pecks. To quarts.

3. Reduce 2 pecks to pints. 2 bushels to pints.

342. Reduce 16 bu. 3 pk. 1 pt. to pints.

bu.	pk.	qt.	pt.
16	3	0	1

4

——

67 pk.

8

——

536 qt.

2

——

1073 pt.

One bushel = 4 pecks. In 16 bushels there are 4 times as many ones of pecks as ones of bushels. 16 multiplied by 4 = 64. There are 64 pecks in 16 bushels. 64 pecks + 3 pecks = 67 pecks.

One peck = 8 quarts. In 67 pecks there are 8 times as many quarts. 8 times 67 = 536. There are 536 quarts in 67 pecks.

One quart = 2 pints. In 536 quarts there are 2 times as many pints. 2 times 536 = 1072. 1072 pints + 1 pint = 1073 pints.

16 bu. 3 pk. 1 pt. = 1073 pints.

1. Reduce 8 bu. 3 pk. 1 pt. to pints.

2. Reduce 15 bu. 3 pk. to quarts.

3. Reduce 12 bu. 1 pk. 3 qt. to pints.

4. Reduce 3 pk. 6 qt. to pints.

To reduce a compound denominate number to a lower denomination:

Multiply the highest denomination by the number of ones of the next lower which make one of the higher, and add to the product the given number of the same denomination.

Proceed in like manner with each successive result, until the number is reduced to the required denomination.

343. Reduce 689 pints to bushels.

2) 689 pt. There are in 689 pints as many quarts
—————— as there are times 2 pints, which is 344,
8) 344 qt. + 1 pt. with 1 pint remaining undivided.

4) 43 pk. There are in 344 quarts as many pecks
—————— as there are times 8 quarts, which is 43.
10 bu. + 3 pk. There are in 43 pecks as many bushels
as there are times 4 pecks, which is 10, with 3 pecks remaining.

689 pints = 10 bu. 3 pk. 1 pt.

1. Reduce 817 pints to bushels.   168 quarts to bushels.
2. Reduce 682 pints to bushels.   95 pints to pecks.
3. Reduce 125 quarts to bushels.   87 pints to pecks.

To reduce a compound denominate number to a higher denomination:

Divide the given number by the number of ones that make one of the next higher denomination.

Divide this quotient and each successive quotient in like manner, until the required denomination is reached.

The last quotient, with the several remainders annexed in proper order, is the result required.

LIQUID MEASURE.

344. Liquid Measure is used in measuring liquids.   The denominations are *gills, pints, quarts, gallons,* and *barrels.*

$$
\begin{aligned}
4 \text{ gills (gi.)} &= 1 \text{ pint (pt.).}\\
2 \text{ pints} &= 1 \text{ quart (qt.).}\\
4 \text{ quarts} &= 1 \text{ gallon (gal.).}\\
31\tfrac{1}{2} \text{ gallons} &= 1 \text{ barrel (bbl.).}
\end{aligned}
$$

The gallon contains 231 cubic inches.
1⅛ pints liquid measure equal 1 pint dry measure.
The barrel contains 31½ gallons; the hogshead 63 gallons.

1. Reduce 15 gallons to pints.   Reduce 18 gallons to gills.

2. Reduce 17 gal. 1 qt. 1 pt. 3 gi. to gills.   Reduce 8 quarts to gills.

3. How many gallons in 47 quarts?   How many gallons in 47 pints?

4. Reduce 86 gills to quarts.   98 gills to gallons.

5. Reduce 25 gal. 1 pt. to gills.   Reduce 19 gallons to pints.

AVOIRDUPOIS WEIGHT.

345. Avoirdupois weight is used in weighing all articles except gold, silver, and precious stones.   The denominations are *ounces, pounds, hundredweights,* and *tons.*

16 ounces (oz.)	= 1 pound (lb.).
100 pounds	= 1 hundredweight (cwt.).
20 hundredweight, 2000 lb.	= 1 ton (T.).

60 pounds of wheat	= 1 bushel.
56 " corn or rye	= 1 "
32 " oats	= 1 "
100 " nails	= 1 cask or keg.
196 " flour	= 1 barrel.
200 " beef or pork	= 1 barrel.

1. Reduce 3 tons to pounds. Reduce 6 hundredweight to ounces.

2. Reduce 7 cwt. 48 lb. 9 oz. to ounces. Reduce 9 tons to ounces.

3. Reduce 54145 pounds to tons. Reduce 3684 ounces to pounds.

4. Reduce 36425 pounds to hundredweights. Reduce 32000 ounces to tons.

5. Reduce 5 T. 12 cwt. 36 lb. to pounds.

EXERCISE.

346. 1. How many pint packages can a seedsman make from 4 bu. 2 pk. and 2 qt. of seeds?

2. What will 1½ barrels of vinegar cost at 8 cents a quart?

3. In one season a market-gardener sold 12345 boxes of strawberries, averaging 1 quart each. How many bushels did he sell?

4. At 7 cents a pound, what will 2½ barrels of pork cost?

5. If a horse eats 1 pk. 6 qt. of oats in a day, how long will 7 bu. 2 pk. last?

MEASURES OF LENGTH.

347. In measures of lengths and distances, the denominations are *inches, feet, yards, rods,* and *miles.*

$$
\begin{array}{ll}
12 \text{ inches (in.)} & = 1 \text{ foot (ft.)}. \\
3 \text{ feet} & = 1 \text{ yard (yd.)}. \\
5\tfrac{1}{2} \text{ yards, or } 16\tfrac{1}{2} \text{ feet} & = 1 \text{ rod (rd.)}. \\
320 \text{ rods} & = 1 \text{ mile (mi.)}. \\
1760 \text{ yards, or } 5280 \text{ feet} & = 1 \text{ mile}.
\end{array}
$$

1. Reduce 12 rods to feet.
2. Reduce 15 rd. 3 yd. 2 ft. to feet.
3. Reduce 136 rd. 4 yd. to inches.
4. Reduce 18 miles to rods.
5. Reduce 4 mi. 130 rd. to rods.
6. Reduce 5 mi. 20 rd. to inches.
7. Change to lowest denominations: $2\tfrac{1}{2}$ miles; 16 rd. 25 ft.; 34 yd.; 16.8 rd. $32\tfrac{1}{2}$ yd. $18\tfrac{1}{2}$ ft.
8. Change to highest denominations: 16000 feet; 63360 inches; 3240 rd.; 7040 yd.; 47520 ft.
9. Measure one side of your school lot and give the length in rods.
10. How many rods are there in $\tfrac{3}{4}$ of a mile?
11. 40 rods is what part of a mile?
12. If the large wheel of a wagon is 15 feet in circumference, how many times will it turn in going 5 mi. 182 rd. 4 yd.?
13. In a bundle of lath there are 100 pieces, each 4 feet long. If all the pieces of the 4 bundles were laid end to end, what would be the length in rods?

14. From *A* to *B* is 17 rods.   One third of that distance is how many feet?

15. How long will it take George to walk a half-mile, if he walks at the rate of 20 rods a minute?

SQUARE MEASURE.

348. In measures of surfaces, the denominations are *square inches, square feet, square yards, square rods,* and *square miles.*

144 square inches (sq. in.)	= 1 square foot (sq. ft.).
9 square feet	= 1 square yard (sq. yd.).
30¼ square yards	= 1 square rod (sq. rd.).
160 square rods	= 1 acre (A.).
640 acres	= 1 square mile (sq. mi.),
	or section (sec.).

349. A surface has two dimensions, *length* and *breadth.*

A plane surface which has four square corners is called a **Rectangle.**

A rectangle which has four equal sides is called a **Square.**

The **Area** of a surface is the number of square units it contains.

350. Suppose the top of a table to be 4 feet long and 2 feet wide.   There are two rows of 4 square feet each; that is, there are 2 times 4 square feet, or 8 square feet, in the surface of the table.   The width of one end shows how many times 4 square units must be taken to give the whole area.
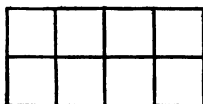
To find the area of a rectangular surface, a certain number of square units are taken a given number of times.

What is the length of one side of a square yard?

Measure off in your schoolyard a square rod. What is the length of each side?

What is the area of a square that is 5½ yards on each side?

351. To find the *area of a rectangular surface:*

The length and breadth being given in the same denomina tion, multiply the length by the breadth.

EXERCISE.

352. Reduce:

1. 140 square rods to square feet.
2. 18 acres to square rods.
3. 12 A. 50 sq. rd. 8 sq. yd. 1 sq. ft. to square feet.
4. 1 square mile to square inches.
5. 112 sq. rd. 5 sq. ft. to square feet.

Reduce to higher denominations:

6. 1440 square rods to acres; 4320 square rods to acres.
7. 23328 square inches to square yards.
8. 10890 square feet to square rods.
9. 102400 sq. rd. to square miles.
10. 5760 A. to square miles.

EXERCISE.

353. 1. How many square inches of surface has a pane of glass 3 feet long and 2 feet wide? (Make a drawing to show the number of rows of square feet; the number of rows of square inches.)

2. How many square inches are there in ¾ of a square foot?   In ⅝ of a square foot?   (Drawing.)

3. How many square inches of surface are there in the top of a table which is 3 feet long and 2½ feet wide?

4. Find the area of a floor which is 12 feet by 15 feet.

5. A floor has a surface of 180 square feet; if its length is 15 feet, what is its width?

6. How many acres are there in a field 18 rods long and 9 rods wide?

7. At $48 an acre, what will be the cost of a piece of land 160 rods long and 118 rods wide?

CUBIC MEASURE.

354. Cubic Measure is used in measuring solids.   Its denominations are *cubic inches, cubic feet, cubic yards,* and *cords.*

> 1728 cubic inches (cu. in.) = 1 cubic foot (cu. ft.).
> 27 cubic feet   = 1 cubic yard (cu. yd.).
> 128 cubic feet   = 1 cord (cd.).

In measuring wood, a pile 8 feet long, 4 feet wide, and 4 feet high is called a *cord.*

355. A **Cube** is a solid bounded by six equal squares.

A **Cubic Foot** is a cube whose faces are each one foot square.

The **Solid Contents** of a body is the number of cubic units it contains.

The base of this cube is divided into square feet. There are 3 rows of 3 square feet each, making in all 3 times 3 square feet, which are 9 square feet.

If upon each square foot we place 3 cubic feet, we shall have 9 times 3 cubic feet, which are 27 cubic feet.
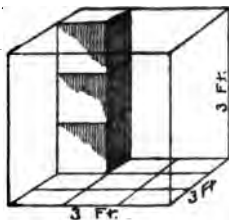
A solid which is 3 feet long, 3 feet wide, and 3 feet high is a **Cubic Yard,** and contains 27 cubic feet.
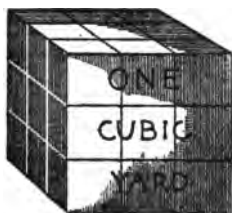
How many cubic feet are there in ⅓ of a cubic yard?

How many cubic feet in ⅓ of a cubic yard?

How many cubic feet in ⅓ of a cubic yard?

9 cu. ft. × 3 = 27 cu. ft.

356. To find the *solid contents of a rectangular solid:*

The length, breadth, and height being given in the same denomination, their product is the number of cubic units, of the same name as the linear units.

357. How many cubic feet of sand will be required to fill this box?

How many cubic feet would there be in a layer of sand 1 foot high in this box?

How many cubic inches are there in one cubic foot? How many square inches of surface has one of the faces?
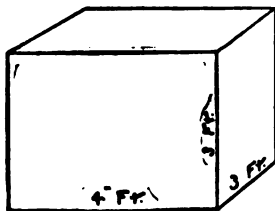
Build the cubic foot of 1-inch cubes.

How many times must 144 cubic inches be taken to make one cubic foot?

358. 1. How many cubic inches are there in 1 cubic yard?   In ⅓ of a cubic yard?   In ⅔ of a cubic yard?

2. Reduce 12 cubic feet to cubic inches.

3. Reduce 87 cubic yards to cubic feet; 62½ cubic yards to cubic feet.

4. Reduce 16 cords to cubic feet; 10¼ cords to cubic feet.

5. Reduce 20736 cubic inches to cubic feet.

6. Reduce 540 cubic feet to cubic yards.

7. Reduce 9 cu. yd. 7 cu. ft. to cubic inches.

8. Reduce 18 cu. yd. 12 cu. ft. 720 cu. in. to cubic inches.

9. Reduce 1152 cubic feet to cords; 6400 cubic feet to cords.

10. How many cubic feet are there in a rectangular block of stone 8 feet long, 5 feet wide, and 3 feet thick?   (Make a drawing to show this.)

11. How many cubic feet are there in a pile of bricks 8 feet long, 4 feet wide, and 4 feet high?

12. A tank 6 feet long, 5 feet wide, and 3 feet deep contains how many cubic inches?

13. How many cubic feet of air does a room 18 feet long, 15 feet wide, and 10 feet high contain?

14. In digging a cellar 16 feet long, 12 feet wide, and 8 feet deep, how many cubic feet of earth must be removed?

15. A pile of wood 16 feet long, 5 feet high, and 4 feet wide contains how many cords?

16. At $.27 a cubic yard, what will it cost to dig a cellar 18 feet long, 14 feet wide, and 9 feet high?

17. How many cubic feet are there in a stick of timber 18 inches wide, 8 inches thick, and 12 feet long?

18. What is the value of a pile of wood 82 feet long, 4 feet wide, and 5 feet high, at $4.50 a cord?

TIME MEASURE.

359. Time Measure is used in measuring time. The denominations are *seconds, minutes, hours, days, weeks, months, years,* and *centuries.*

60 seconds (sec.)	= 1 minute (min.).
60 minutes	= 1 hour (hr.).
24 hours	= 1 day (d.).
7 days	= 1 week (wk.).
365 days	= 1 year (yr.).
366 days	= 1 leap year (l. yr.).
100 years	= 1 century (C.).

February has 28 days, except in leap year, when it has 29.

September, April, June, and November, each have 30 days; other months of the year (except February) each have 31 days.

In business transactions, 12 months are considered a year and 30 days a month.

360. Reduce to lower denominations:

1. 12 hours to seconds; 5 days to minutes.

2. 8 d. 12 h. 40 min. to seconds.

3. How many minutes were there in the month of February, 1904 (l. yr.)?

Reduce to higher denominations:

4. 1440 minutes to days; 86400 seconds to days.

5. 52560 hours to years; 4743856 minutes to years.

MISCELLANEOUS PROBLEMS.

361. 1. Find from the diagram the number of square yards of tiling used for the floor of a corridor.

Divide into two rectangles and find the area of each.

290 ft.

60 ft.

290 ft.

60 ft.

2. Find the number of square yards in the floor of this room.

Divide into two rectangles, one of which shall be 2 feet by 6 feet.

3. How many square yards are there in the ceiling?

30 ft.

15 ft.

12 ft.

6 ft. 2

4. How many square yards are there in the walls of a room 20 feet by 16 feet, and 9½ feet high, if no allowance is made for doors and windows?

The area of the four walls of a room is equal to that of a rectangle whose length is equal to the sum of the four sides, and whose breadth is equal to the height of the room.

2 × 20 ft. + 2 × 16 ft. = 72 ft.   72 ft. × 9½ ft. = 684 sq. ft.

684 sq. ft. + 9 = 76 sq. yd.

Draw the rectangle which represents the area of the walls of the room.

30 ft.

5. How many square yards are there in walls, floor, and ceiling of this room?

9½ feet high

15 ft.

6 ft.

12 ft.

6. How many square yards are there in a roof, the
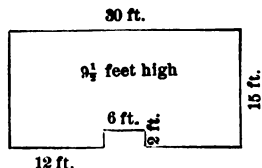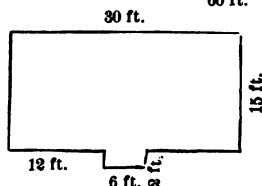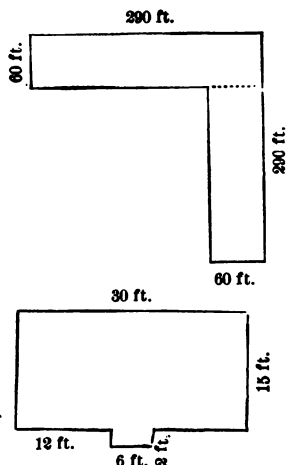
rafters of which are 16 feet long and the ridge-pole 25 feet long?

7. If the height of a staircase is 15 feet, and that of each step is 9 inches, how many steps are there in the staircase?

8. How many cords of wood are there in a pile 40 feet long, 4 feet wide, and 5½ feet high?

9. How many cords of wood can be piled under a shed 24 feet long, 18 feet wide, and 12 feet high?

10. How many boxes, 4 inches long, 3 inches wide, and 2 inches deep, can be packed in a box 3 feet long, 3 feet wide, and 2 feet deep, measured on the inside?

11. How many fence boards, each 16 feet long, are required to fence a field 80 rods long and 40 rods wide, the fence being 4 boards high?

12. Mr. A's orchard covers 2½ acres. Allowing two square rods for each tree, how many trees are there?

13. How many loads of earth of 1 cubic yard each will be needed to fill in a lot, 45 feet front, 90 feet deep, to raise it 1½ feet?

14. The factors of a dividend are 16, 50, and 9; of the divisor, 15, 8, and 2. What is the quotient?

15. A farmer gave 55 sheep for 11 young horses worth $60 each. What money value did he get for each sheep?

16. At 60 cents a cord, how many days will it take a man to earn $75.00, if he saws 2 cords of wood a day?

17. If a turkey weighing 10½ pounds costs $1.68, what is the cost, at the same rate, of one that weighs 15¾ pounds?

18. At 1½ dollars each, how many lamps can be bought for 6⅞ dollars?

19. At $\frac{7}{10}$ of a dollar per yard, how many yards of ribbon can be bought for $2\frac{4}{5}$ dollars?

20. A gentleman gave away $\frac{1}{6}$ of the books in his library, lent $\frac{1}{5}$ of the remainder, and sold $\frac{1}{4}$ of what was left. He then had 360 books remaining How many had he at first ?

21. If a lady spends $4\frac{4}{6}$ dollars per month for carfare, in what time will she spend $27\frac{1}{2}$?

22. The owner of a schooner sells .35$\frac{1}{2}$ of the vessel to the captain. What part does he still own?

23. The minuend is 67.081. What must the subtrahend be to leave a remainder of 56.009?

24. A owns $\frac{7}{10}$ of an iron foundry and sells .75 of his share for $2100. What is the value of the whole foundry?

25. A flour merchant bought 137 barrels of flour at $7.875 per barrel. He sold 89 barrels at $9.378 per barrel, and the remainder brought only $5.80 per barrel. What was his gain?

26. Two men start from the same place and travel in opposite directions. One travels 119.33 miles a day, and the other 123.75 miles a day. How far will they be apart at the end of six days?

27. Supposing that each child in a schoolroom ought to have 80 cubic feet of air, how many children should sit in a room which is 20 feet long, 18 feet wide, and 12 feet high?

28. The walk from our kitchen door to the stable is 75 feet long and 4.5 feet wide. How many bricks does it contain, each brick being 8 inches by 4 inches?

29. How many times is 4 cubic inches contained in a four-inch cube?
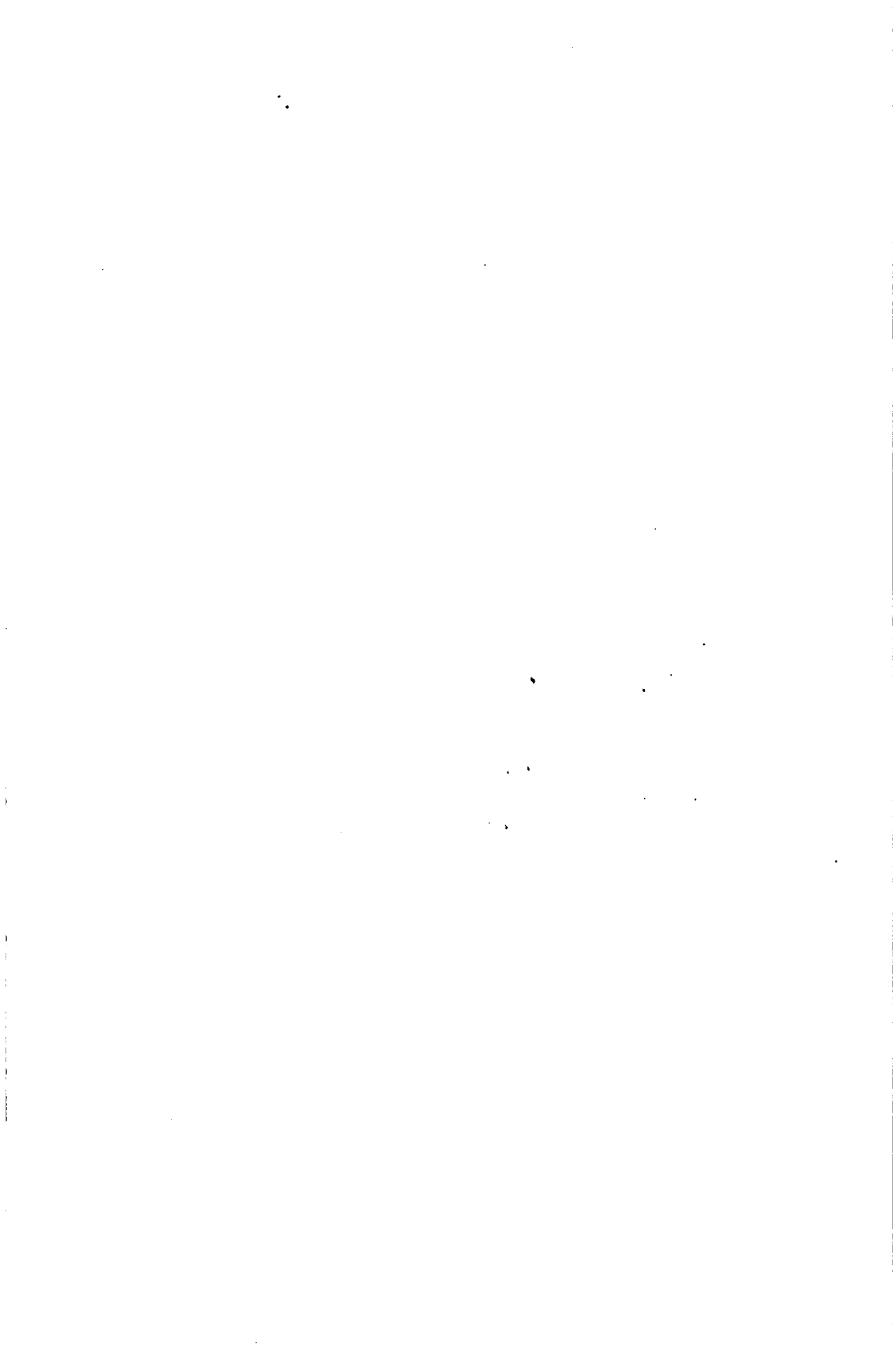
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